

# **mitsubishi**

## **Mitsubishi Industrial Robot**

### **RH-1000G/1500G Series      INSTRUCTION MANUAL**

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**ROBOT ARM SETUP & MAINTENANCE**

## Revisions Table

Thank you for purchasing the Mitsubishi Industrial Robot MELFA Series.

Some changes have been made to the “Mitsubishi industrial robot RH-1000G/1500G series INSTRUCTION MANUAL “ (BFP-A8036).

The details are given below. We ask that you please reflect these changes onto the Instruction Manuals on hand.

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\*The plain washer for the installation bolt was added.

Use the bolt, the spring washer, and this plain washer to install the robot.

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# Caution

Users of the robot given as a "Object Model" in "Table 1: List of origin position joint angles" must observe the details below.



## Warning

Do not release the brakes from an external source and forcibly move the robot arm at a high speed.

If the operation is carried out, a warning error indicating positional deviation (error No.: L1820) may occur. If it is confirmed that the position has deviated after carrying out "1. Operation to confirm positional deviation of origin position", the origin data has been lost.

In this case, reset the origin with the ABS method. Refer to section "5.5.1 ABS method" in the separate "Instruction Manual/Robot Arm Setup to Maintenance" for the operation methods.

If operation is carried out without resetting the origin, interference with peripheral devices or unforeseen operation could occur due to the loss of origin data.

### 1. Operation to confirm positional deviation of origin position

(1) Set each axis of the robot to the ABS mark using the teaching box's joint jog operation.

(2) Confirm that the joint angle displayed on the teaching box screen matches the value corresponding to the object model given in Table 1. If the values do not match, reset the origin with the ABS method.

Table 1: List of origin position joint angles (Position aligned with ABS mark arrow)

Object Model	Joint angle					
	J1	J2	J3	J4	J5	J6
RH-1000GHDC-SA	0degree	0degree	150mm	0degree		
RH-1000GJDC-SA	0degree	0degree	150mm	0degree	0degree	
RH-1000GHLC-SA	0degree	0degree	0degree	0degree		
RH-1000GJLC-SA	0degree	0degree	0degree	0degree	0degree	
RH-1500GJC-SA/SB	138.7 degree	140 degree	0degree	180 degree	0degree	
RH-1500GC-SA**/SA5* -SB**/SB5*	138.7 degree	140 degree	0degree	180 degree	0degree	0degree
RC-1000GHWDC-SA	0degree	0degree	0degree	180 degree		
RC-1000GHWLC-SA	0degree	0degree	0degree	180 degree		

## Safety Precautions

Always read the following precautions and the separate "Safety Manual" before starting use of the robot to learn the required measures to be taken.

### CAUTION

All teaching work must be carried out by an operator who has received special training. (This also applies to maintenance work with the power source turned ON.)  
→ Enforcement of safety training

### CAUTION

For teaching work, prepare a work plan related to the methods and procedures of operating the robot, and to the measures to be taken when an error occurs or when restarting. Carry out work following this plan. (This also applies to maintenance work with the power source turned ON.)  
→ Preparation of work plan

### WARNING

Prepare a device that allows operation to be stopped immediately during teaching work. (This also applies to maintenance work with the power source turned ON.)  
→ Setting of emergency stop switch

### CAUTION

During teaching work, place a sign indicating that teaching work is in progress on the start switch, etc. (This also applies to maintenance work with the power source turned ON.)  
→ Indication of teaching work in progress

### WARNING

Provide a fence or enclosure during operation to prevent contact of the operator and robot.  
→ Installation of safety fence

### CAUTION

Establish a set signaling method to the related operators for starting work, and follow this method.  
→ Signaling of operation start

### CAUTION

As a principle turn the power OFF during maintenance work. Place a sign indicating that maintenance work is in progress on the start switch, etc.  
→ Indication of maintenance work in progress

### CAUTION

Before starting work, inspect the robot, emergency stop switch and other related devices, etc., and confirm that there are no errors.  
→ Inspection before starting work

The points of the precautions given in the separate "Safety Manual" are given below. Refer to the actual "Safety Manual" for details.

-  **CAUTION** Use the robot within the environment given in the specifications. Failure to do so could lead to a drop or reliability or faults. (Temperature, humidity, atmosphere, noise environment, etc.)
-  **CAUTION** Transport the robot with the designated transportation posture. Transporting the robot in a non-designated posture could lead to personal injuries or faults from dropping.
-  **CAUTION** Always use the robot installed on a secure table. Use in an instable posture could lead to positional deviation and vibration.
-  **CAUTION** Wire the cable as far away from noise sources as possible. If placed near a noise source, positional deviation or malfunction could occur.
-  **CAUTION** Do not apply excessive force on the connector or excessively bend the cable. Failure to observe this could lead to contact defects or wire breakage.
-  **CAUTION** Make sure that the workpiece weight, including the hand, does not exceed the rated load or tolerable torque. Exceeding these values could lead to alarms or faults.
-  **WARNING** Securely install the hand and tool, and securely grasp the workpiece. Failure to observe this could lead to personal injuries or damage if the object comes off or flies off during operation.
-  **WARNING** Securely ground the robot and controller. Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.
-  **CAUTION** Indicate the operation state during robot operation. Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.
-  **WARNING** When carrying out teaching work in the robot's movement range, always secure the priority right for the robot control. Failure to observe this could lead to personal injuries or damage if the robot is started with external commands.
-  **CAUTION** Keep the jog speed as low as possible, and always watch the robot. Failure to do so could lead to interference with the workpiece or peripheral devices.
-  **CAUTION** After editing the program, always confirm the operation with step operation before starting automatic operation. Failure to do so could lead to interference with peripheral devices because of programming mistakes, etc.
-  **CAUTION** Make sure that if the safety fence entrance door is opened during automatic operation, the door is locked or that the robot will automatically stop. Failure to do so could lead to personal injuries.
-  **CAUTION** Never carry out modifications based on personal judgments, or use non-designated maintenance parts. Failure to observe this could lead to faults or failures.
-  **WARNING** When the robot arm has to be moved by hand from an external area, do not place hands or fingers in the openings. Failure to observe this could lead to hands or fingers catching depending on the posture.
-  **CAUTION** Do not stop the robot or apply emergency stop by turning the robot controller's main power OFF. If the robot controller main power is turned OFF during automatic operation, the robot accuracy could be adversely affected.

Revision history

Date of print	BFP No.	Details of revisions
1999-11-17	BFP-A8036	First print.
2000-06-20	BFP-A8036-A	The attached place of origin data history table was added. The method of replacing the battery was added. Spare parts list was added..
2000-11-29	BFP-A8036-B	Error in writing correction.
2001-03-16	BFP-A8036-C	Caution in transportation of the robot was added. Base plate was added. Error in writing correction.
2002-05-22	BFP-A8036-D	The method of grease replenishment to J3 axis was modified. Error in writing correction.

## ■ Introduction

Thank you for purchasing the Mitsubishi industrial robot.

This instruction manual explains procedures to be taken for unpacking, installing, servicing and inspecting the robot arm.

Always read through this manual before starting use to ensure correct usage of the robot.

The contents of this manual correspond to the following robot models.

<Model>\*RH-1000GHDC-SA

\*RH-1000GJDC-SA

\*RH-1000GHLC-SA

\*RH-1000GJLC-SA

\*RH-1500GJC-SA

\*RH-1500GJC-SB

\*RH-1500GC-SA

\*RH-1500GC-SB

\*RH-1500GVC-SA

\*RH-1500GVC-SB

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- The details of this manual are subject to change without notice.
- The information contained in this document has been written to be accurate as much as possible. Please interpret that items not described in this document "cannot be performed."  
Please contact your nearest dealer if you find any doubtful, wrong or skipped point.

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## 1 Before starting use

This chapter explains the details and usage methods of the instruction manuals, the basic terminology and the safety precautions.

### 1.1 Using the instruction manuals

#### 1.1.1 The details of each instruction manuals

The contents and purposes of the documents enclosed with this product are shown below. Use these documents according to the application.

For special specifications, a separate instruction manual describing the special section may be enclosed.

Safety Manual	Explains the common precautions and safety measures to be taken for robot handling, system design and manufacture to ensure safety of the operators involved with the robot.
Standard Specifications	Explains the product's standard specifications, factory-set special specifications, option configuration and maintenance parts, etc. Precautions for safety and technology, when incorporating the robot, are also explained.
Robot Arm Setup & Maintenance	Explains the procedures required to operate the robot arm (unpacking, transportation, installation, confirmation of operation), and the maintenance and inspection procedures.
Controller Setup, Basic Operation and Maintenance	Explains the procedures required to operate the controller (unpacking, transportation, installation, confirmation of operation), basic operation from creating the program to automatic operation, and the maintenance and inspection procedures.
Detailed Explanation of Functions and Operations	Explains details on the functions and operations such as each function and operation, commands used in the program, connection with the external input/output device, and parameters, etc.
Troubleshooting	Explains the causes and remedies to be taken when an error occurs. Explanations are given for each error No.

### 1.1.2 Symbols used in instruction manual

The symbols and expressions shown in [Table 1-1](#) are used throughout this User's Manual. Learn the meaning of these symbols before reading this instruction manual.

Table 1-1 : Symbols in instruction manual

Symbol	Meaning
 <b>DANGER</b>	Precaution indicating cases where there is a risk of operator fatality or serious injury if handling is mistaken. Always observe these precautions to safely use the robot.
 <b>WARNING</b>	Precaution indicating cases where the operator could be subject to fatalities or serious injuries if handling is mistaken. Always observe these precautions to safely use the robot.
 <b>CAUTION</b>	Precaution indicating cases where operator could be subject to injury or physical damage could occur if handling is mistaken. Always observe these precautions to safely use the robot.
[ JOINT ]	If a word is enclosed in brackets or a box in the text, this refers to a key on the teaching pendant.
[ + / FORWD ] + [ + X ] (A) (B)	This indicates to press the (B) key while holding down the (A) key. In this example, the [+ / Forward] key is pressed while holding down the [+X / +Y] key.
[ STEP / MOVE ] + ([ COND ] → [ RPL ↓ ] ) (A) (B) (C)	This indicates to hold down the (A) key, press and release the (B) key, and then press the (C) key. In this example, the [Step / Move] key is held down, the [Condition] key is pressed and released, and the [Replace ↓] key is pressed.
T / B	This indicates the teaching pendant.

## 1.2 Safety Precautions

Always read the following precautions and the separate "Safety Manual" before starting use of the robot to learn the required measures to be taken.

-  **CAUTION** All teaching work must be carried out by an operator who has received special training. (This also applies to maintenance work with the power source turned ON.)  
→ Enforcement of safety training
-  **CAUTION** For teaching work, prepare a work plan related to the methods and procedures of operating the robot, and to the measures to be taken when an error occurs or when restarting. Carry out work following this plan. (This also applies to maintenance work with the power source turned ON.)  
→ Preparation of work plan
-  **WARNING** Prepare a device that allows operation to be stopped immediately during teaching work. (This also applies to maintenance work with the power source turned ON.)  
→ Setting of emergency stop switch
-  **CAUTION** During teaching work, place a sign indicating that teaching work is in progress on the start switch, etc. (This also applies to maintenance work with the power source turned ON.)  
→ Indication of teaching work in progress
-  **DANGER** Provide a fence or enclosure during operation to prevent contact of the operator and robot.  
→ Installation of safety fence
-  **CAUTION** Establish a set signaling method to the related operators for starting work, and follow this method.  
→ Signaling of operation start
-  **CAUTION** As a principle turn the power OFF during maintenance work. Place a sign indicating that maintenance work is in progress on the start switch, etc.  
→ Indication of maintenance work in progress
-  **CAUTION** Before starting work, inspect the robot, emergency stop switch and other related devices, etc., and confirm that there are no errors.  
→ Inspection before starting work

### 1.2.1 Precautions given in the separate Safety Manual

The points of the precautions given in the separate "Safety Manual" are given below. Refer to the actual "Safety Manual" for details.

-  **CAUTION** Use the robot within the environment given in the specifications. Failure to do so could lead to a drop or reliability or faults. (Temperature, humidity, atmosphere, noise environment, etc.)
-  **CAUTION** Transport the robot with the designated transportation posture. Transporting the robot in a non-designated posture could lead to personal injuries or faults from dropping.
-  **CAUTION** Always use the robot installed on a secure table. Use in an instable posture could lead to positional deviation and vibration.
-  **CAUTION** Wire the cable as far away from noise sources as possible. If placed near a noise source, positional deviation or malfunction could occur.
-  **CAUTION** Do not apply excessive force on the connector or excessively bend the cable. Failure to observe this could lead to contact defects or wire breakage.
-  **CAUTION** Make sure that the workpiece weight, including the hand, does not exceed the rated load or tolerable torque. Exceeding these values could lead to alarms or faults.
-  **WARNING** Securely install the hand and tool, and securely grasp the workpiece. Failure to observe this could lead to personal injuries or damage if the object comes off or flies off during operation.
-  **WARNING** Securely ground the robot and controller. Failure to observe this could lead to malfunctioning by noise or to electric shock accidents.
-  **CAUTION** Indicate the operation state during robot operation. Failure to indicate the state could lead to operators approaching the robot or to incorrect operation.
-  **WARNING** When carrying out teaching work in the robot's movement range, always secure the priority right for the robot control. Failure to observe this could lead to personal injuries or damage if the robot is started with external commands.
-  **CAUTION** Keep the jog speed as low as possible, and always watch the robot. Failure to do so could lead to interference with the workpiece or peripheral devices.
-  **CAUTION** After editing the program, always confirm the operation with step operation before starting automatic operation. Failure to do so could lead to interference with peripheral devices because of programming mistakes, etc.
-  **CAUTION** Make sure that if the safety fence entrance door is opened during automatic operation, the door is locked or that the robot will automatically stop. Failure to do so could lead to personal injuries.
-  **CAUTION** Never carry out modifications based on personal judgments, or use non-designated maintenance parts. Failure to observe this could lead to faults or failures.
-  **WARNING** When the robot arm has to be moved by hand from an external area, do not place hands or fingers in the openings. Failure to observe this could lead to hands or fingers catching depending on the posture.
-  **CAUTION** Do not stop the robot or apply emergency stop by turning the robot controller's main power OFF. If the robot controller main power is turned OFF during automatic operation, the robot accuracy could be adversely affected.

## 2 Unpacking to Installation

### 2.1 Confirming the product

The standard configuration of the robot arm section, part of the purchased product, is shown in [Table 2-1](#).

Confirm the parts.

Users who have purchased optional products should refer to the separate "Standard Specifications".

Table 2-1 : Standard configuration

No.	Part name	Type	Qty.	Remarks
1	Robot arm	RH-1000GHDC-SA/GJDC-SA RH-1000GHLC-SA/GJLC-SA RH-1500GJC-SA/SB RH-1500GC-SA/SB or RH-1500GVC-SA/SB	1 unit	
2	Guarantee card		1 copy	
3	Installation bolts	M20x60	4 pcs.	For RH-1000GHDC-SA/GJDC-SA.
		M20x65	8 pcs.	For a model not listed above.
4	Disc spring washer for installation bolt	For M20	4 pcs.	For RH-1000GHDC-SA/GJDC-SA.
			8 pcs.	For a model not listed above.
5	Bottle cap	For M16	2 pcs.	For plugging the eye bolt screw hole. Install after removing the eye bolt.
		For M20	4 pcs.	2 pcs. for RH-1000GHDC-SA/GJDC-SA 4 pcs. for a model not listed above.

## 2.2 Installation

### 2.2.1 Unpacking

The robot is packaged in a wooden crate when shipped. Unpack the robot from the crate. Handle the robot arm following the section ["2.2.2Transportation procedures"](#) in this manual.

- (1) Remove the wood crate for transporting the robot arm.
- (2) Remove the hexagon nuts fixing the wood crate base and robot arm.
- (3) Transport the robot in this state.



**CAUTION** Desiccant is charged in the above vinyl bag. Please dispose of this.

### 2.2.2 Transportation procedures

- 1) Transport the robot in the packaged state to the unpacking place when possible.
- 2) Unpack the robot.
- 3) Using the following transportation methods (crane or lifter), move the robot to the installation place, and while taking care to the direction, install following ["2.2.3Installation procedures"](#).

#### ■ Caution in transportation of the robot

We recommend the transport method (without hand) as described in the Instruction Manual. However, if the transport of the robot arm with hand is requested by the customer, a fixing measure, such as one of those described below, must be taken by the customer. Fix the robot arm and the hand before transporting.

[Fixing method]

#### 1) RH-1000G\*DC

Using the screw holes for the hanging bolts on the top surface of the vertical axis base, install a gate-shape fixture, and fix the robot arm and the hand in place so that they will not move when they are transported.

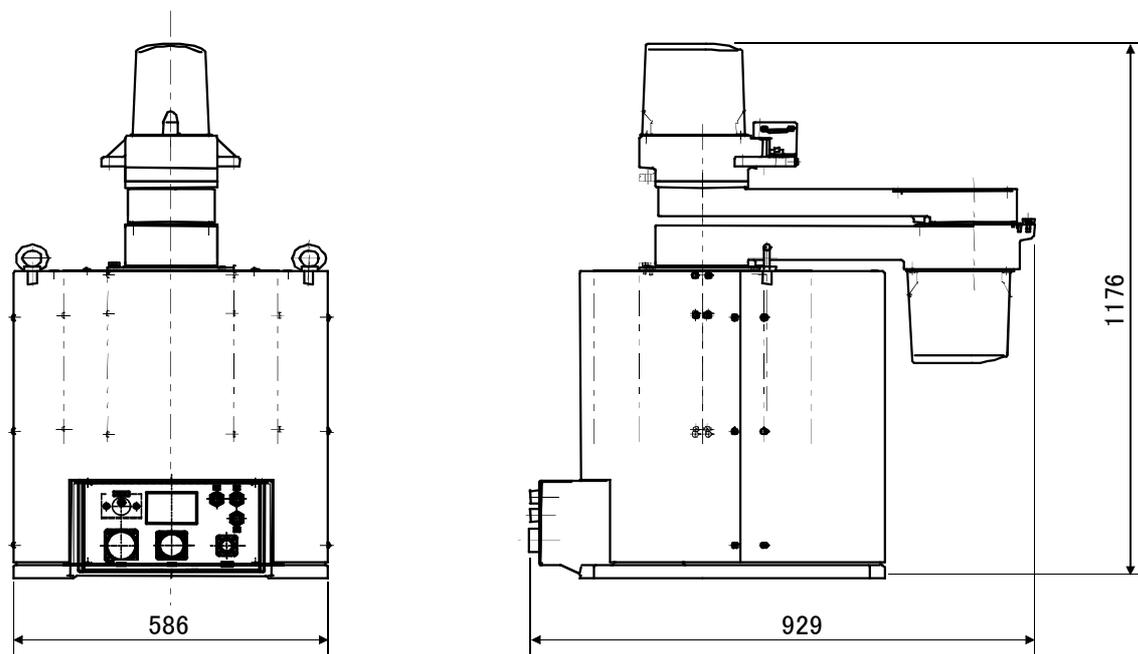
#### 2) RH-1000G\*LC, 1500G

Using the screw holes for the hanging bolts on the robot base section, install a gate-shape fixture, and fix the robot arm and the hand in place so that they will not move when they are transported.

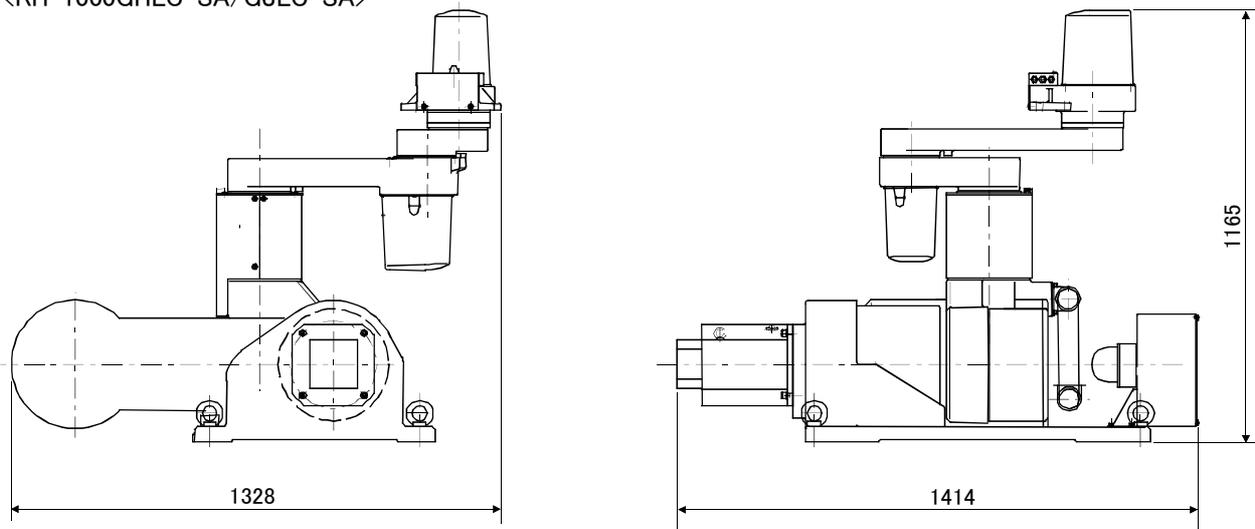
(1) Transporting the robot

The transportation posture of each model is shown as follows.

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA>



<RH-1500G series>

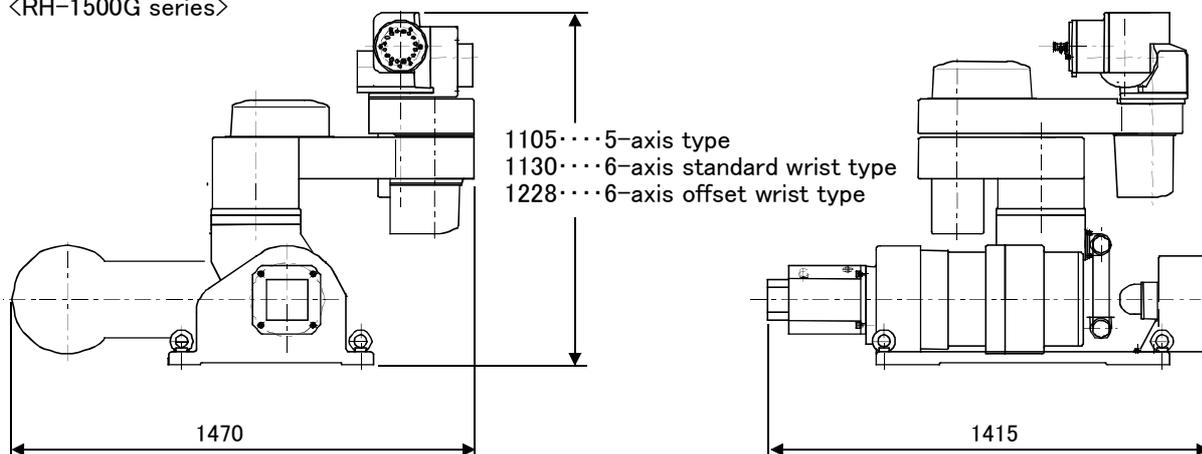


Fig.2-1 : Transportation posture

(2) Transporting with a crane

The transportation method with a crane of each model is shown as follows.

■ RH-1000GHDC-SA/GJDC-SA

Catch two wires into the M16 eye bolts, and suspend the robot. At this time, make sure that the wires and robot do not interfere.

After installing, remove the eye bolts. Install the enclosed bolt caps in the screw holes from where the eye bolts were removed.

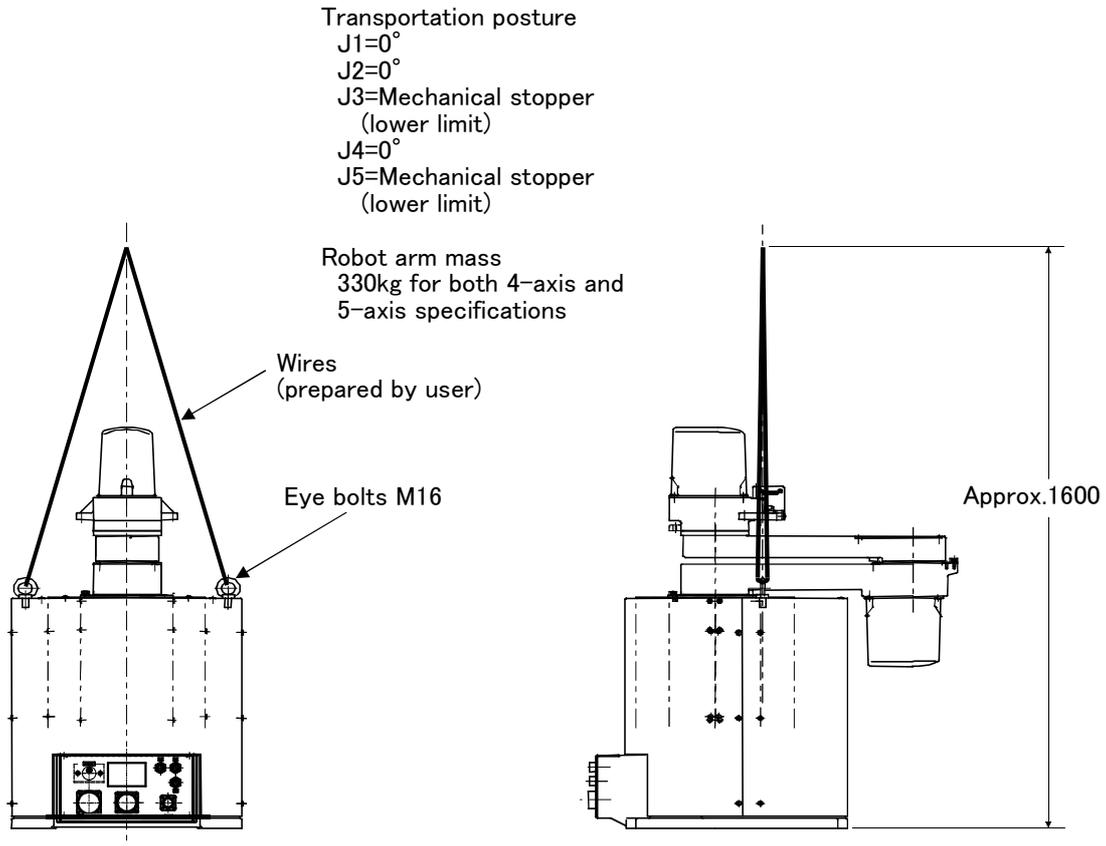


Fig.2-2 : Transportation method (RH-1000GHDC-SA/GJDC-SA)

■ RH-1000GHLC-SA/GJLC-SA, RH-1500G series

Catch four wires into the M20 eye bolts, and suspend the robot. At this time, make sure that the wires and robot do not interfere.

After installing, remove the eye bolts. Install the enclosed bolt caps in the screw holes from where the eye bolts were removed.

Transportation posture

<RH-1000GHLC-SA/GJLC-SA> <RH-1500G series>

J1=-25°

J2=-75°

J3=Mechanical stopper  
(lower limit)

J4=0°

J5=Mechanical stopper  
(minus limit)

J1=-25°

J2=+125°

J3=Mechanical stopper  
(lower limit)

J4=J5=J6=0°

Robot arm mass

<RH-1000GHLC-SA/GJLC-SA>

590kg

<RH-1500G series>

5-axis type :650kg

6-axis type :670kg

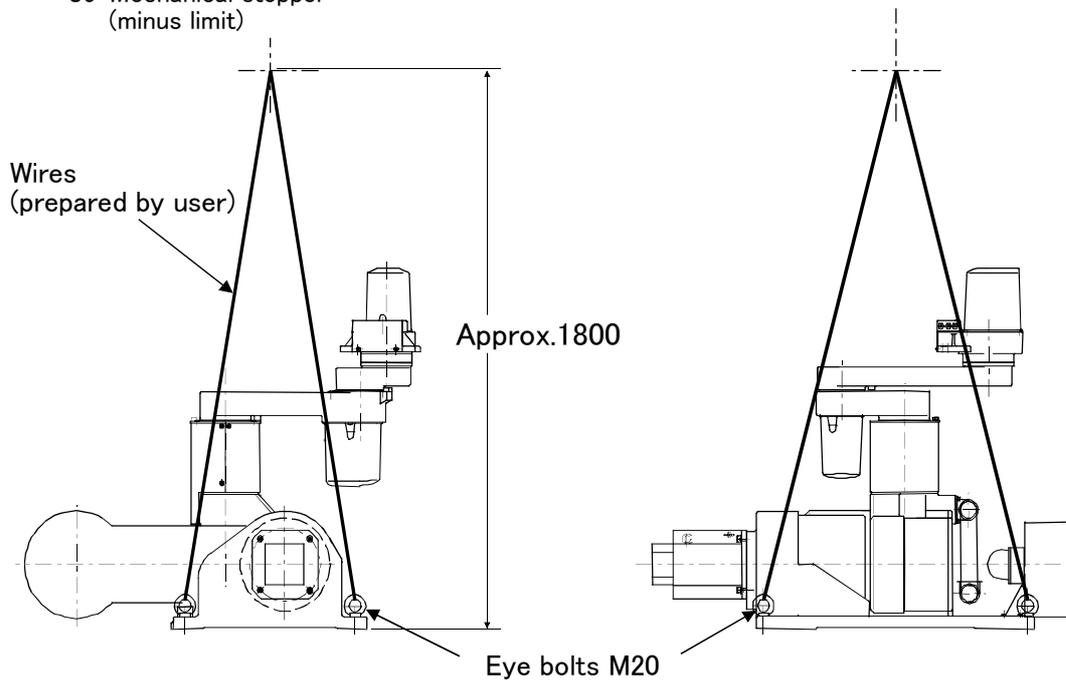


Fig.2-3 : Transportation method (RH-1000GHLC-SA/GJLC-SA, RH-1500G series)

(3) Transportation with the lifter (Only RH-1000GHLC-SA/GJLC-SA and RH-1500G series)

Using the notches on the four corners of the robot arm base, lift up the robot arm with a claw jack, etc., and then place the robot arm on the lifter and transport.

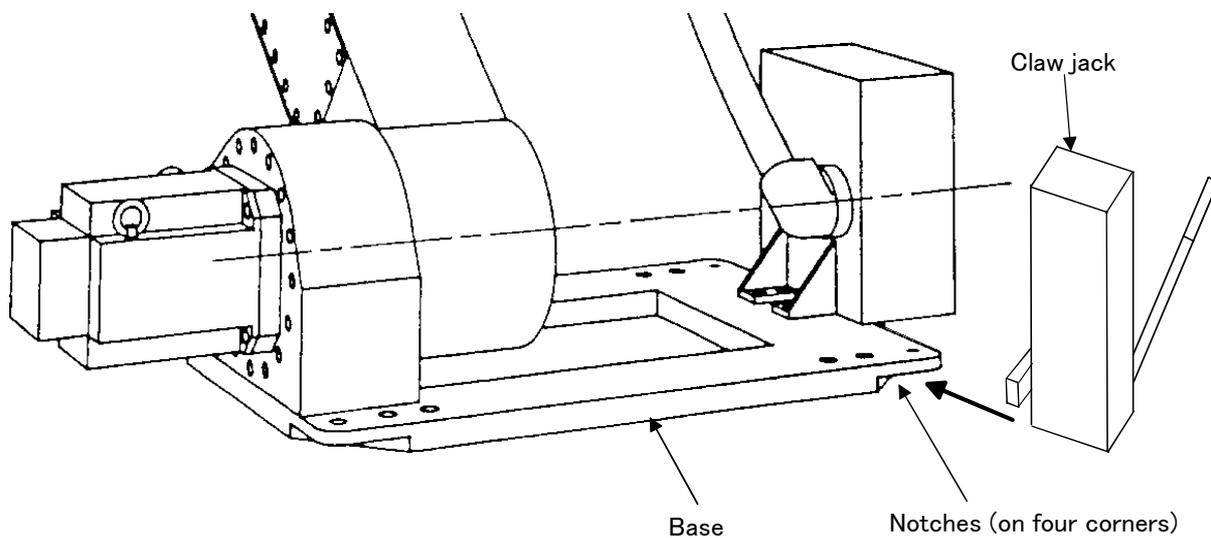


Fig.2-4 : Transportation of robot (RH-1000GHLC-SA/GJLC-SA、RH-1500G series)

## 2.2.3 Installation procedures

### (1) Installation reference

Maintaining the optimum functions of the robot is the most important point of installing the robot arm. In respect to the robot arm fixing and foundation, to maintain the path accuracy while withstanding the weight applied on the arm and the reaction during movement, the robot arm must be fixed with sufficient force so that it does not move. Install the arm on the base plate. Outside dimensions of the base plate for each type are shown in the [Fig. 2-5](#), [Fig. 2-6](#) and [Fig. 2-7](#).

Make sure that any protrusion, such as the head of the bolt for fixing the base plate is within 35mm from the robot installation surface on the base plate.

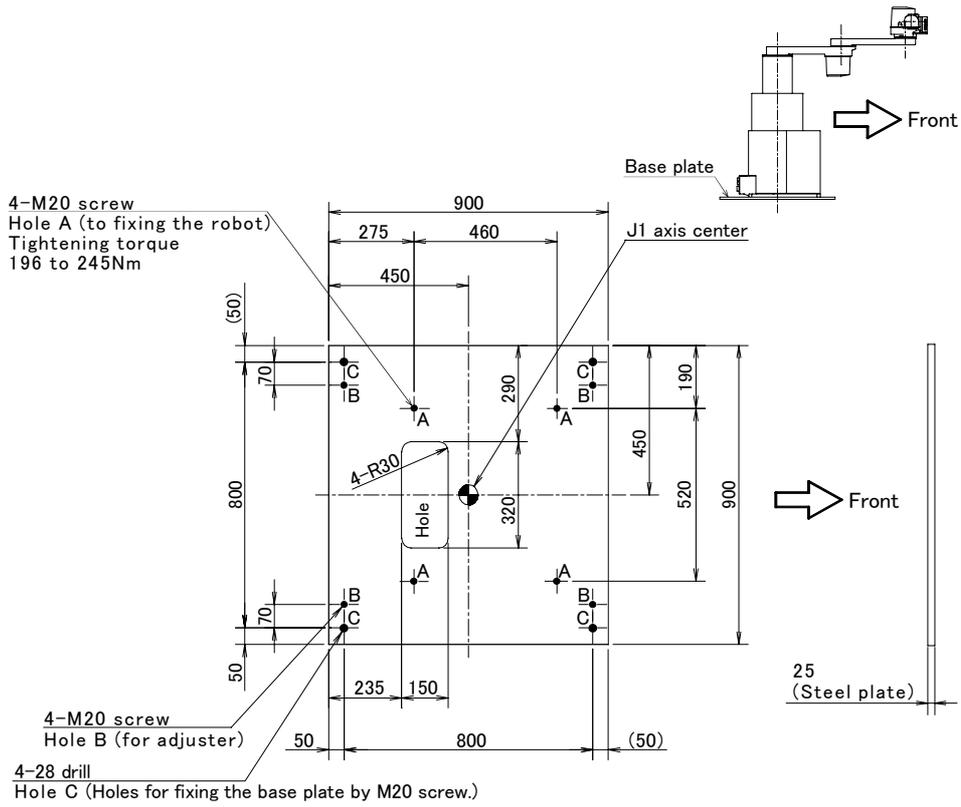
Secure an installation floor having strength that can withstand the force shown in [Table 2-2](#) and [Table 2-3](#). The direction of the moment applied on the floor is shown in [Fig. 2-8](#).

Table 2-2 : Installation floor strength (Mass)

Class	Robot arm mass (kg)	Base plate mass (kg)
RH-1000GHDC-SA/GJDC-SA	330	126
RH-1000GHLC-SA/GJLC-SA	590	126
RH-1500G series	5-axis type:650 6-axis type:670	126

Table 2-3 : Strength of installation floor (Moment)

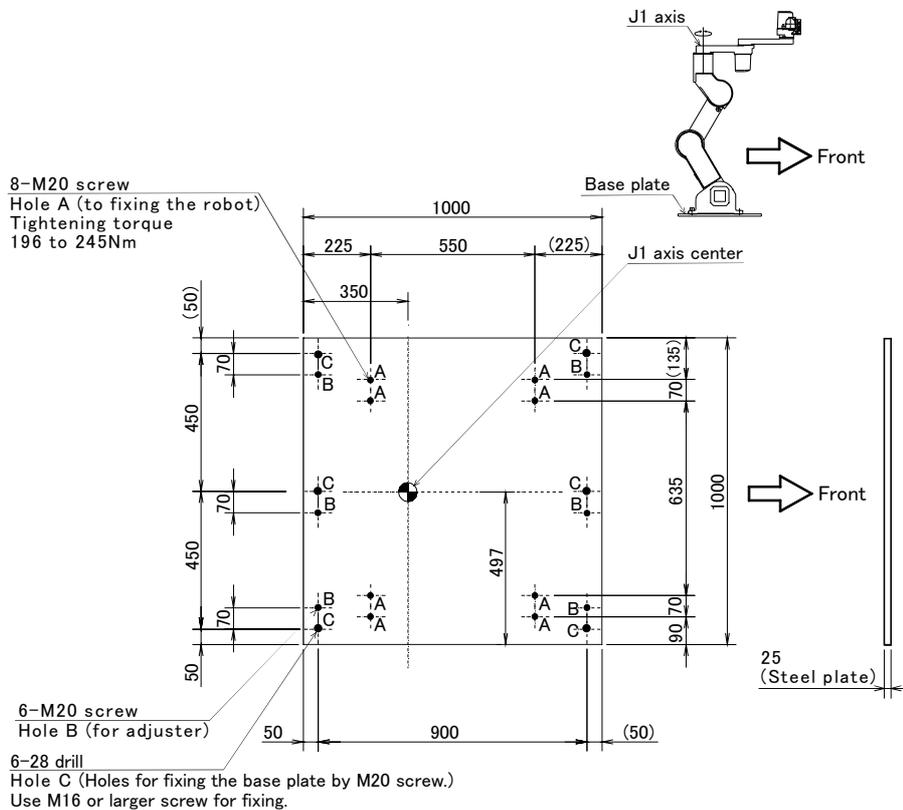
Class	Normal force	Force during emergency stop
	Robot tilting moment M1,M2(N m)	Robot tilting moment M1,M2(N m)
RH-1000GHDC-SA/GJDC-SA	850	1,700
RH-1000GHLC-SA/GJLC-SA	980	3,900
RH-1500G series	2,450	12,250



Note)

For fixing on a concrete floor, use the anchor bolt strong enough to meet the following condition.  
Example: M16 mechanical anchor embedding depth 60 mm (Concrete compressive-strength 20 MPa).

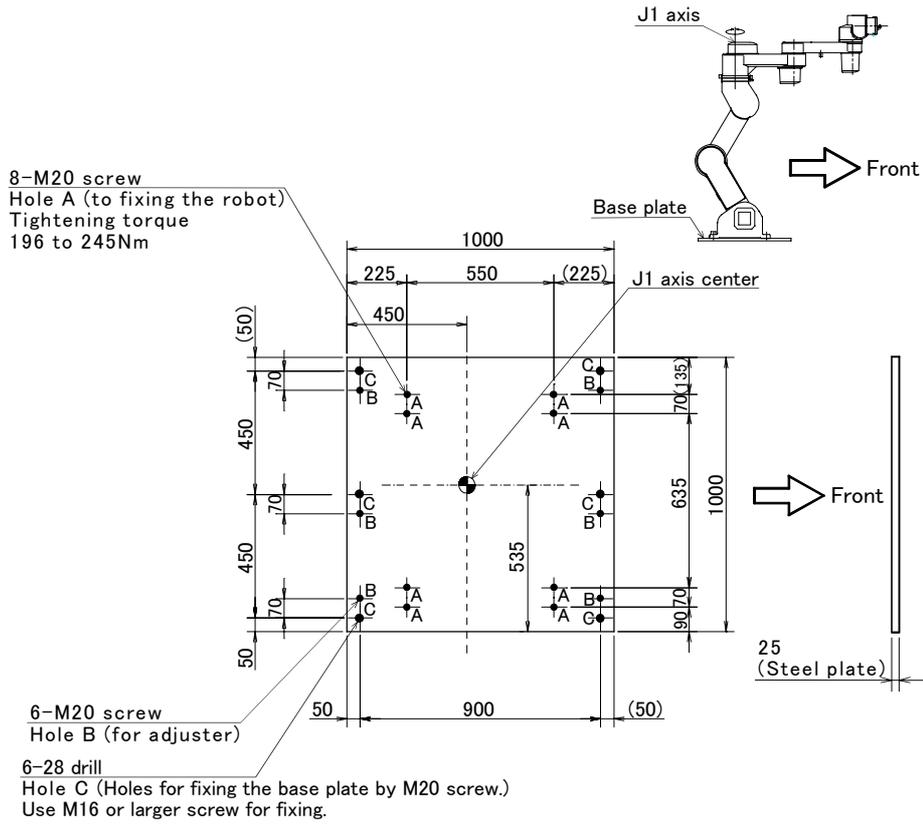
Fig.2-5 : Base plate(RH-1000GHDC-SA/GJDC-SA)



Note)

For fixing on a concrete floor, use the anchor bolt strong enough to meet the following condition.  
Example: M16 mechanical anchor embedding depth 60 mm (Concrete compressive-strength 20 MPa).

Fig.2-6 : Base plate(RH-1000GHLC-SA/GJLC-SA)

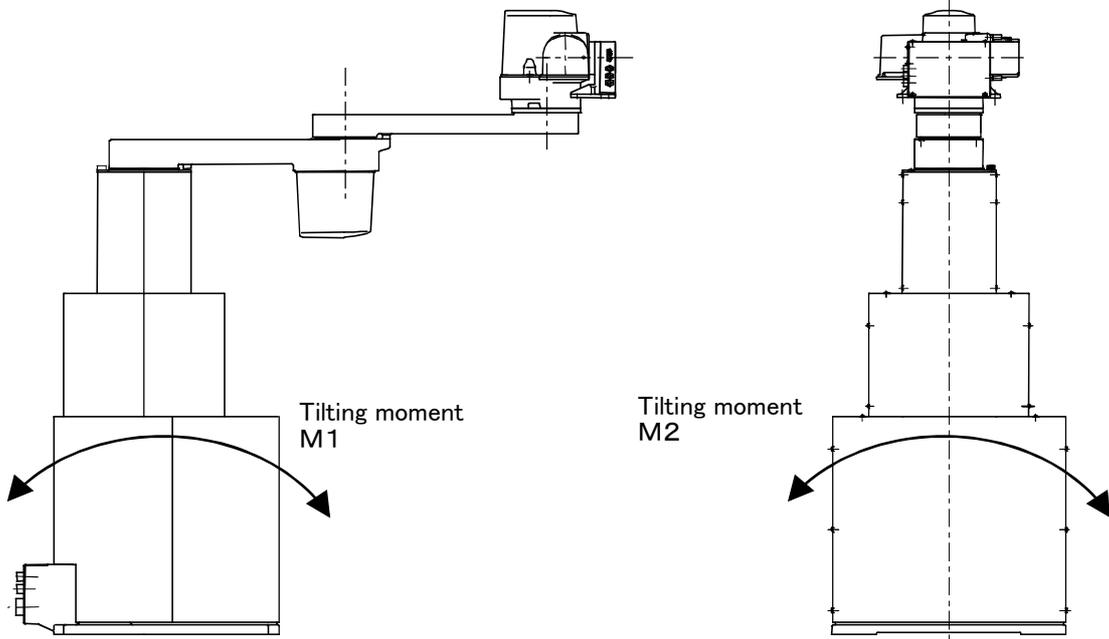


Note)

For fixing on a concrete floor, use the anchor bolt strong enough to meet the following condition.  
Example: M16 mechanical anchor embedding depth 60 mm (Concrete compressive-strength 20 MPa).

Fig.2-7 : Base plate(RH-1500G series)

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>

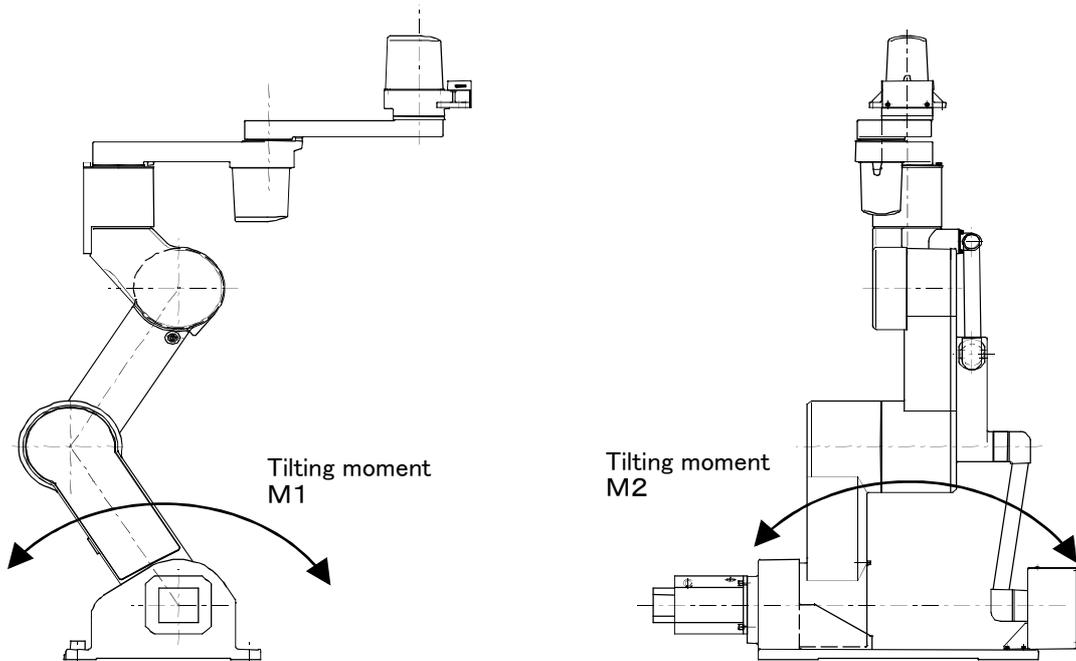


Fig.2-8 : Direction of robot tilting moment

## (2) Adjusting the levelness

The robot arm levelness is adjusted with the following procedure.

The adjustment positions of RH-1000GHDC-SA/GJDC-SA are shown in Fig. 2-9, and RH-1000GHLC-SA/GJLC-SA, RH-1500G series are shown in Fig. 2-10.

- 1) Adjustment position: Measure the levelness on the J1 installation base in the transportation posture.
- 2) Adjustment method: Place shims between the robot arm and base plate so that the X and Y direction levels are within 0.3mm/1m.

<RH-1000GHDC-SA/GJDC-SA>

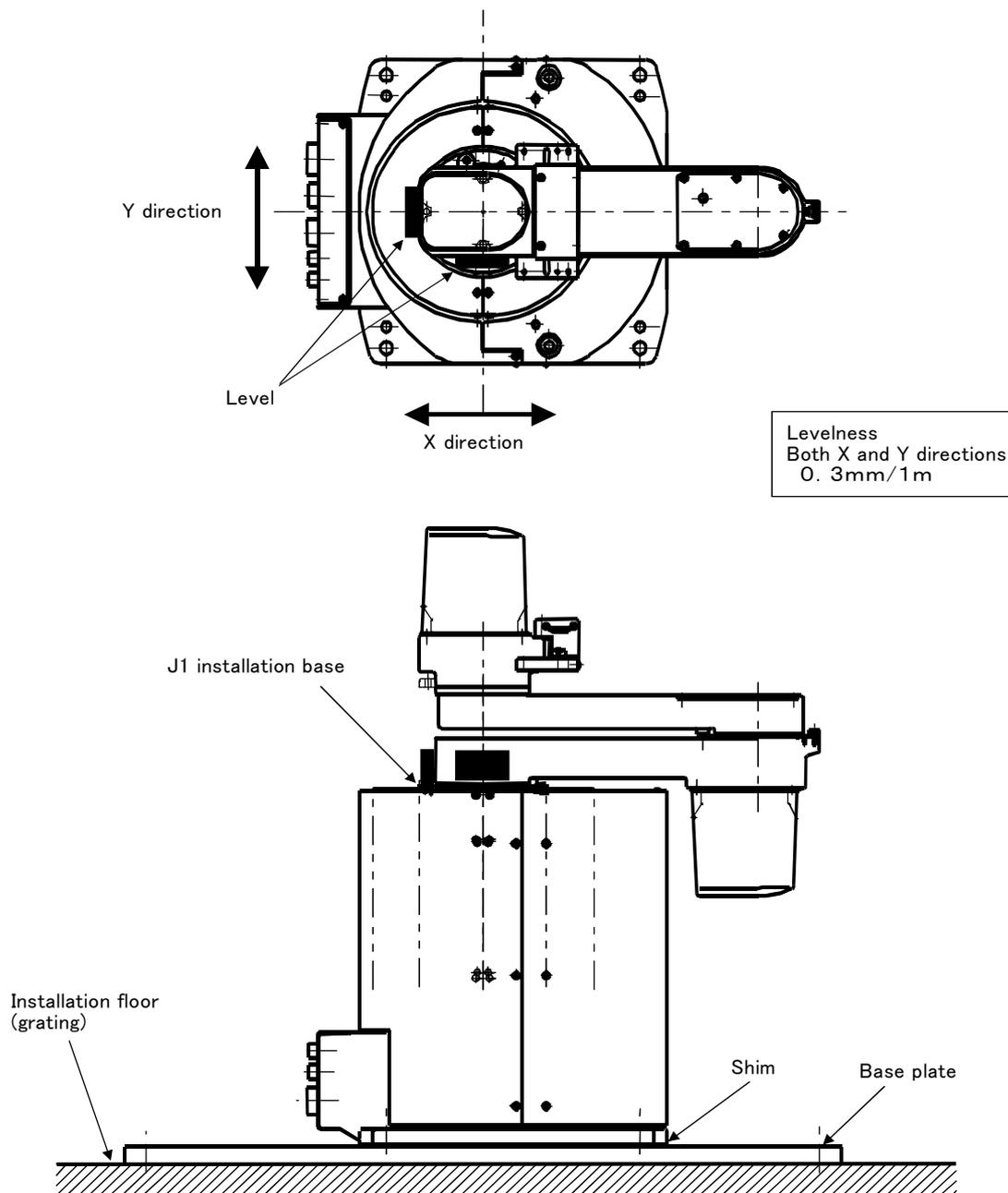
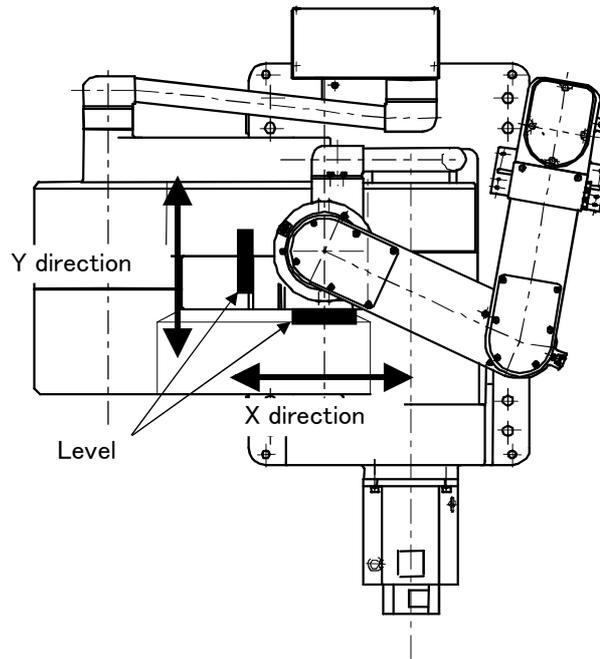


Fig.2-9 : Adjusting the levelness (RH-1000GHDC-SA/GJDC-SA)

<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>



Levelness  
Both X and Y directions  
0.3mm/1m

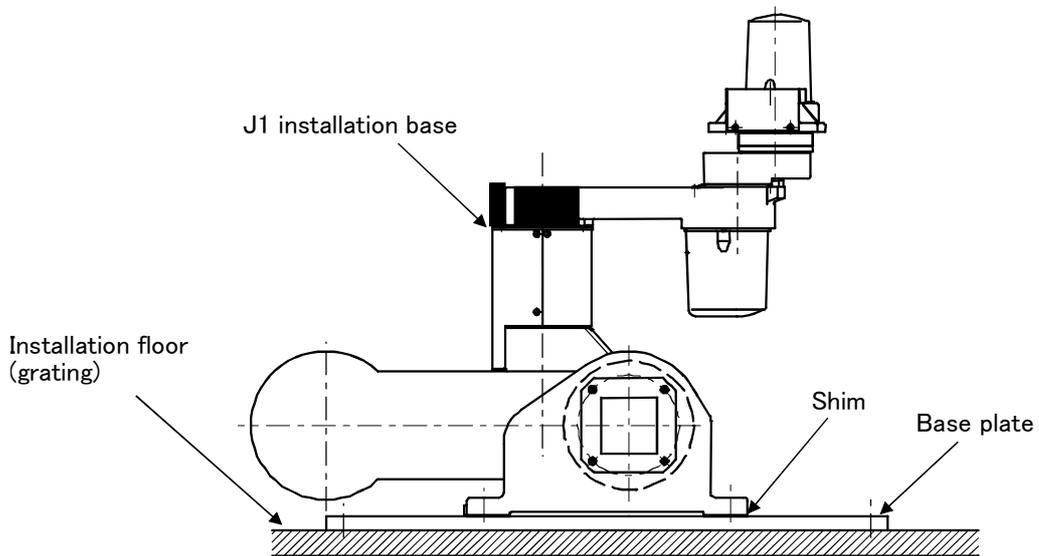
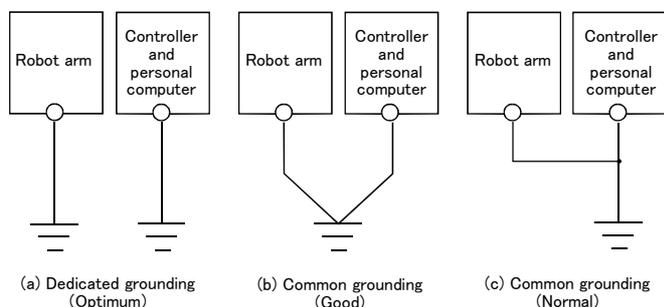


Fig.2-10 : Adjusting the levelness (RH-1000GHLC-SA/GJLC-SA, RH-1500G series)

## 2.2.4 Grounding procedures

### (1) Grounding methods



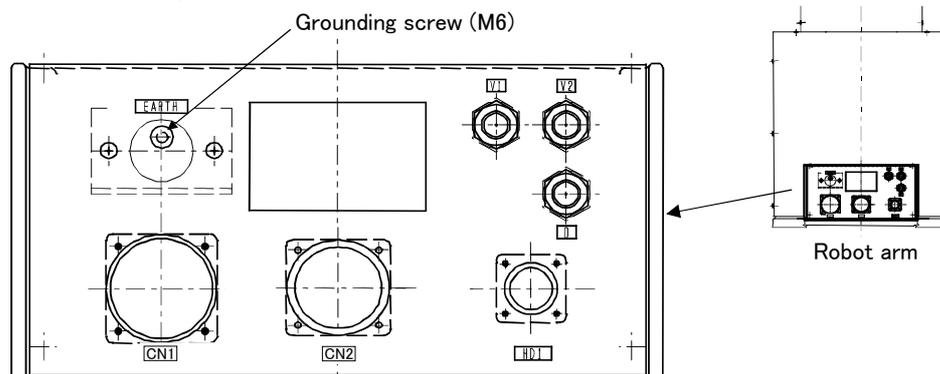
- 1) There are three grounding methods as shown in Fig. 2-11 3, but the dedicated grounding (Fig. 2-11 (a)) should be used for the robot arm and controller when possible. (Refer to the separate "Controller setup, basic operation, and maintenance" for details on the controller grounding.)
- 2) Use Class D grounding (grounding resistance 100Ω or less). Dedicated grounding separated from the other devices should be used.
- 3) Use a AWG#11(3.5mm<sup>2</sup>) or more stranded wire for the grounding wire. The grounding point should be as close to the robot arm and controller as possible, and the length of the grounding wire should be short.

Fig.2-11 : Grounding methods

### (2) Grounding procedures

- 1) Prepare the grounding cable (AWG#11(3.5mm<sup>2</sup>) or more) and robot side installation screw.
- 2) Connect the grounding cable to the grounding screw section.

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>

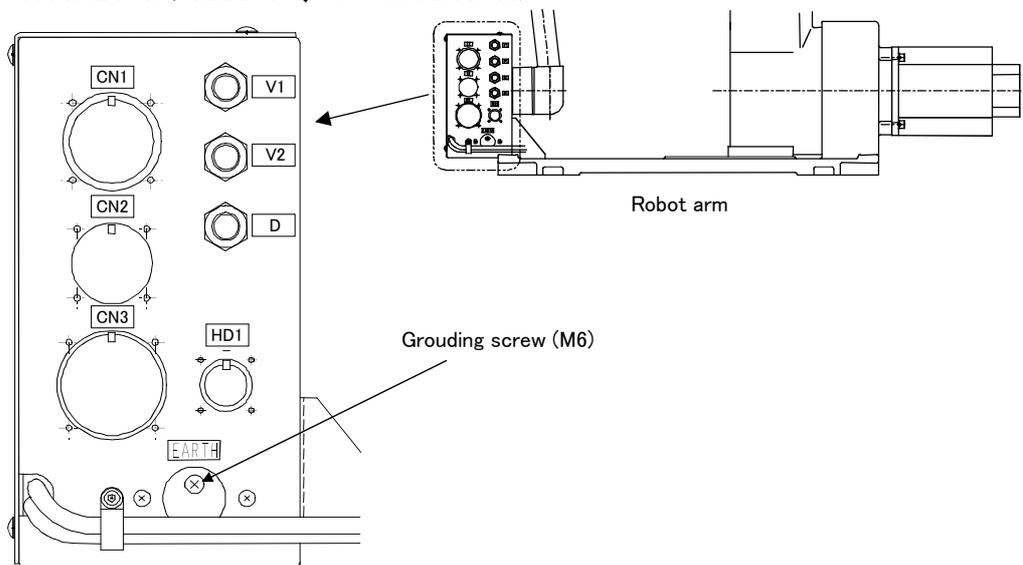
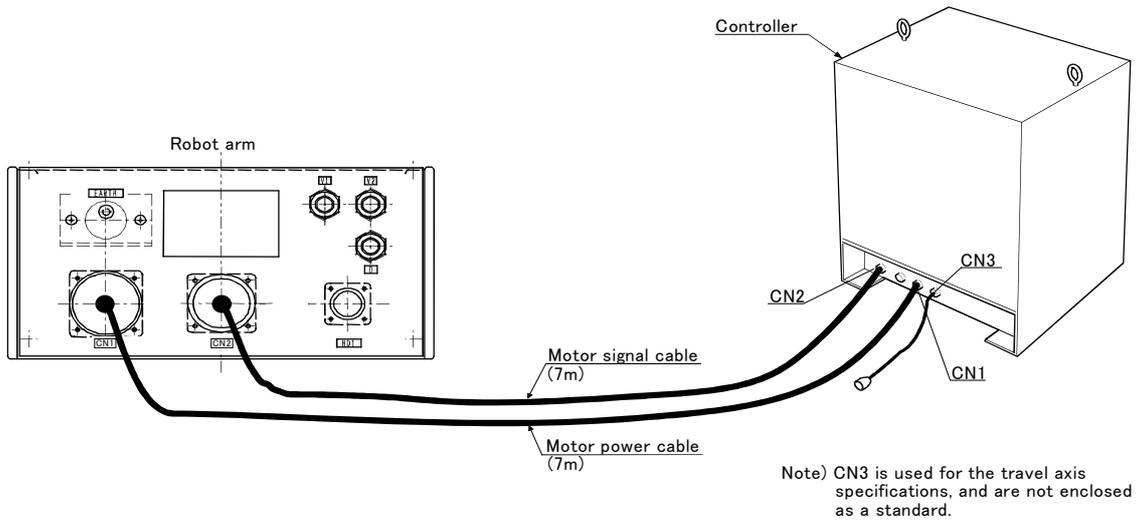


Fig.2-12 : Connecting the grounding cable

2.2.5 Connecting with the controller

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>

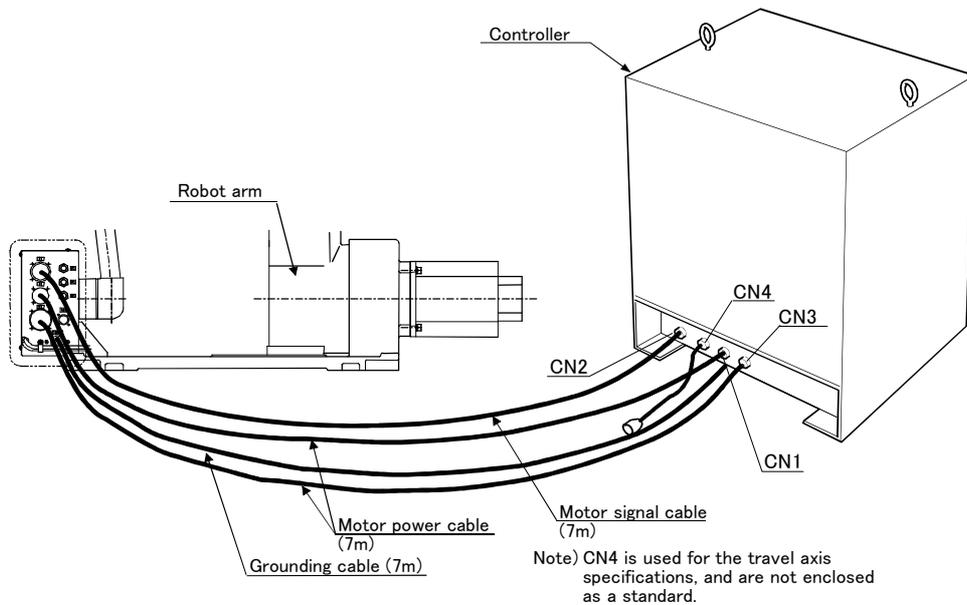


Fig.2-13 : Connecting the machine cables

Carry out the following procedure after installing the controller referring to the separate "Controller setup, basic operation, and maintenance" manual.

- 1) Make sure that the power switch on the front of the controller is turned OFF.
- 2) Connect the machine cable to the robot arm and the corresponding connector on the controller.

**CAUTION**

The machine cable connectors are dedicated for the controller side and robot arm side, so take special care when connecting. If connected incorrectly, the connector pins could bend or break. Thus, even if connected correctly, the robot will not operate correctly, creating a dangerous situation.

**CAUTION**

Take special care to the leading of the connection cable. If the cable is pulled with force or bent excessively, wires could break or the connector could be damaged.

## 2.3 Setting the origin

The origin is set so that the robot can be used with a high accuracy. After purchasing the robot, always carry out this step before starting work. This step must also be carried out if the combination of robot and controller being used is changed. There are several methods for setting the origin, but the origin data input method will be explained here. Refer to [Page 88, "5.5 Resetting the origin"](#) for the other methods.

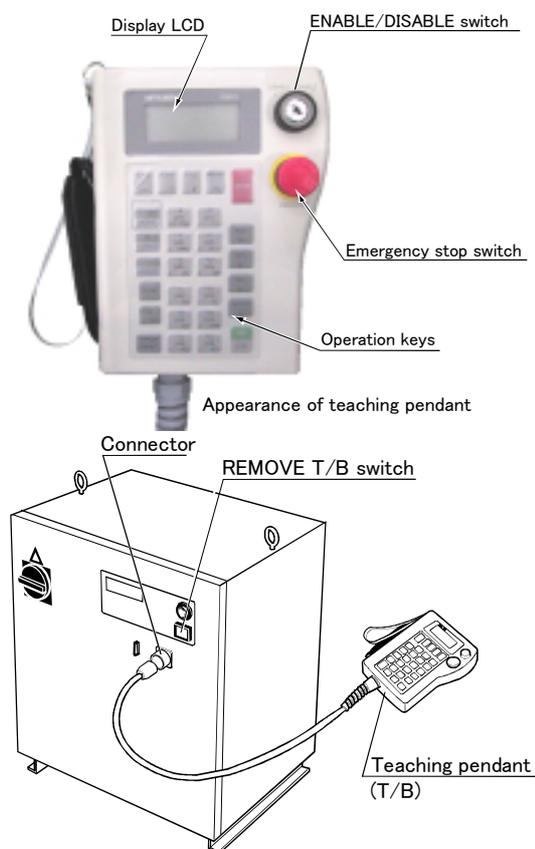
The teaching pendant is required for this operation.

### 2.3.1 Installing the teaching pendant (T/B)

By using the "REMOVE T/B" switch, the T/B can be installed and removed while the controller's control power is ON. However, in this procedure, the teaching pendant will be installed with the control power OFF.

Refer to the separate "From Controller Setup to Maintenance" for details on installing the teaching pendant with the control power ON.

#### (1) Installing with the control power OFF



- 1) Confirm that the controller's power supply switch is OFF.
- 2) Connect the T/B connector to the RS-422 (T/B) connector on the controller.
- 3) Do not pull the cable with force or bend it excessively, as the cable could break or the connector could be damaged.
- 4) Confirm that the [REMOVE T/B] switch on the side of the controller is not depressed (is projected).
- 5) Set the T/B [ENABLE/DISABLE] switch to "DISABLE".

Fig.2-14 : Installing the T/B (control power OFF)

#### ◆◆◆ [REMOVE T/B] switch ◆◆◆

When using the robot with the T/B, this switch is used to invalidate the emergency stop from the T/B. This is also used to install the T/B with turning the controller's power supply ON.

2.3.2 Setting the origin with the origin data input method

(1) Confirming the origin data

● Origin data history table (Origin Data History) Serial No.ES804008

Date	Default	. . . .	. . . .	. . . .
D	V!#S29			
J 1	06DTYY			
J 2	2?HL9X			
J 3	1CP55V			
J 4	T6!M\$Y			
J 5	Z2IX%Z0			
J 6	Z3IX%Y0			
Method	E	E · N · S P	E · N · S P	E · N · S P

The origin data to be input is noted in the origin data sheet enclosed with the arm. (Refer to Fig. 2-15)

The value given in the default setting column is the origin settings set with the calibration jig before shipment. J5 and J6 are valid only for the axis exist.

(O: AlphabetO, 0: Zero)

**Note) Meanings of symbols in method column**

- E: Jig method
- N: Not used
- SP: Not used

Fig.2-15 : Origin data label (an example)

The attached place of the origin data history table is shown in the following.

RH-1000GHDC-SA/GJDC-SA.....The back side of the robot arm back cover.

Except for the above.....The back side of the robot arm connector box cover.

Referring to Page 83 "Fig. 5-27Replacing the battery", remove the cover, and confirm the value.



**WARNING**

Always install/remove the cover with the controller control power turned OFF. Failure to do so could lead to physical damage or personal injury should the robot start moving due to incorrect operations.

(2) Turning ON the control power



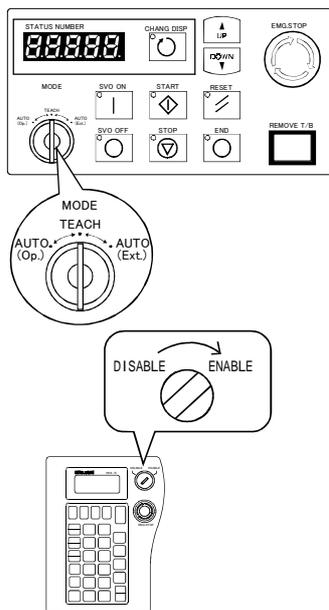
**CAUTION**

Confirm that there are no operators near the robot before turning the power ON.

- 1) Turn the controller [POWER] switch ON.

The control power will be turned ON, and " □ . 100" will appear on the STATUS NUMBER display on the front of the controller.

## (3) Preparing the T/B



Next, prepare to use the T/B.

1) Set the [MODE] switch on the front of the controller to "TEACH".

2) Set the T/B [ENABLE/DISABLE] switch to "ENABLE". The menu selection screen will appear.

The following operations are carried out with the T/B.

#### ◆◆◆ Operating from the T/B ◆◆◆

Always set the [MODE] switch (mode selection key switch) on the front of the controller to "TEACH", and then set the T/B [ENABLE/DISABLE] switch to "ENABLE".

When the T/B is valid, only operations from the T/B are possible. Operations from the controller or external signals will not be accepted.

#### ◆◆◆ When T/B operations are mistaken ◆◆◆

The displayed screen will return to the "menu selection screen" when the [MENU] key is pressed. Carry out the operations again from this screen. Operations can also be carried out again by setting the T/B [ENABLE/DISABLE] switch to "DISABLE" once and then setting to "ENABLE".

(4) Selecting the origin setting method

<T/B screen> [Keys used]

<MENU>  
 1.TEACH 2.RUN  
 3.FILE 4.MONI  
 5.MAINT 6.SET

+C  
 (J6)  
 5 STU

1) Press the [5] key on the menu screen, and display the maintenance screen.

<MAINT>  
 1.PARAM 2.INIT  
 3.BRAKE 4.ORIGIN  
 5.POWER

-Y  
 (J2)  
 4 MNO

2) Press the [4] key on the maintenance screen, and display the origin setting method selection screen.

<ORIGIN>  
 1.DATA 2.MECH  
 3.JIG 4.ABS  
 5.USER

-B (J5) INP  
 1 DEF EXE

3) Press the [1] key on the origin setting method selection screen, and select the data input method.

The origin data input method will be selected, and the screen for turning OFF the servo power will appear.

<ORIGIN>  
 SERVO OFF  
 OK?( )  
 1:EXECUTE

-B (J5) INP  
 1 DEF EXE

4) Press the [1] and [INP] keys to turn OFF the servo power. The screen for inputting the origin data will appear.

<DATA>D(000000)  
 1:000000 000000  
 3:000000 000000  
 5:000000 000000

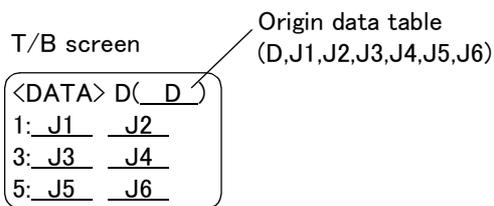
◆◆◆ Selecting a menu ◆◆◆

The menu can be selected with one of the following methods.

A: Press the numeral key for the No. of the item to be selected.

B: Using the [ ↓ ] and [ ↑ ] keys, etc., move the cursor to the item to be selected, and then press the [INP] key.

(5) Inputting the origin data



Input the value confirmed in section Page 20, “(1) Confirming the origin data”.

The correspondence of the origin data label value and axis to be input is shown in Fig. 2-16.

J5 and J6 are input only for the each axis exist.

Fig.2-16 : Correspondence of origin data label and axis

The method for inputting the origin data is explained below. The value shown in Fig. 2-15 will be input as an example.

<T/B screen>	[Keys used]	
<pre>&lt;DATA&gt;D(000000) 1:000000 000000 3:000000 000000 5:000000 000000</pre>		1) Confirm that the cursor is at the “D” position on the T/B display screen.
<pre>&lt;DATA&gt;D(V00000) 1:000000 000000 3:000000 000000 5:000000 000000</pre>		2) Input the D value V!%S29. Inputting “V” Press the [VWX] key once while holding down the [CHAR] key. “V” will appear, so release the [CHAR] key. “V” will be set.
<pre>&lt;DATA&gt;D(V!0000) 1:000000 000000 3:000000 000000 5:000000 000000</pre>		<u>Inputting “!”</u> Press the [#%!] key three times while holding down the [CHAR] key. “!” will appear, so release the [CHAR] key. “!” will be set.
<pre>&lt;DATA&gt;D(V!0000) 1:000000 000000 3:000000 000000 5:000000 000000</pre>	   	In the same manner, while holding down the [CHAR] key, press the [“%”] key twice, and the [STU] key once (input “S”). Release the [CHAR] key, and press the [2] key (input “2”) and then the [9] key (input “9”). V!%S29 will appear at the “D” data on the teaching pendant screen.
<pre>&lt;DATA&gt;D(V!%S29) 1:000000 000000 3:000000 000000 5:000000 000000</pre>		3) Press the [ ↓ ] key, and move the cursor to the J1 input position. 4) Input the J1 value in the same manner as above.
<pre>&lt;DATA&gt;D(V!%S29) 1:06DTYY 2?HL9X 3:1CP55V T6!M\$Y 5:Z2!J%Z0 A12%Z0</pre>		5) Input the J2, J3, J4 values in the same manner. Input the J5 and J6 value if exist. 6) After inputting all of the values, press the [INP] key. The origin setting confirmation screen will appear.
<pre>&lt;DATA&gt;D(V!%S29) CHANGES TO ORIGIN OK? (■) ■:EXECUTE ■</pre>	 	7) [Press [1] (-B/-P) and [INP] key to end the origin setting.

◇◆◇ Moving the cursor ◇◆◇

Press the [ ↑ ], [ ↓ ], [ ← ] and [ → ] keys.

◇◆◇ Inputting characters ◇◆◇

Hold down the [CHAR] key and press the key with the character to be input on the lower right. Three characters will scroll each time the character key is pressed.

◇◆◇ Correcting an input ◇◆◇

After returning one character by pressing the [DEL] key, input the character again.

◇◆◇ If the origin input data is incorrect ◇◆◇

If the origin input data is incorrect, the alarm No. 1760 (origin setting data illegal) will occur during the orthogonal jog, tool jog operation or automatic operation described later.

In this case, reconfirm the value input for the origin data.

## 2.4 Confirming the operation

In this section, the robot will be moved manually using the T/B to confirm that the operation is correct. Moving the robot manually is called "jog operation". This operation includes the JOINT jog that moves each axis, the XYZ jog that moves along the base coordinate system, the TOOL jog that moves along the tool coordinate system, and the CYLINDER jog that moves along the circular arc.

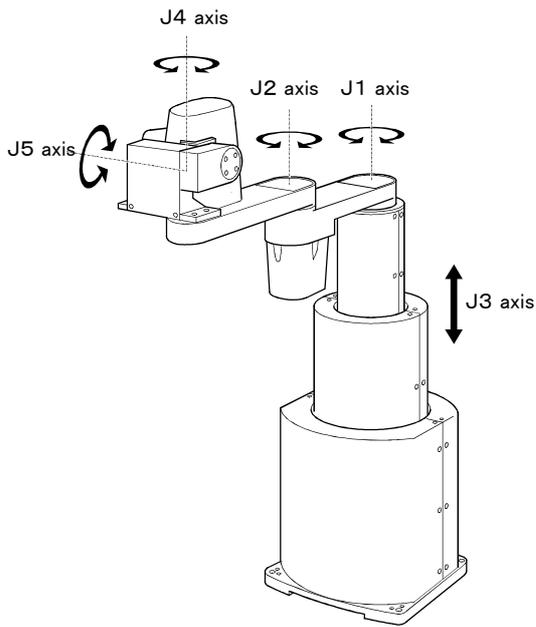
This operation is carried out while pressing the deadman switch on the back of the T/B.

 **CAUTION** The robot will move during this operation. Make sure that there are no operators near the robot, and that there are no obstacles, such as tools, in the robot operation range.

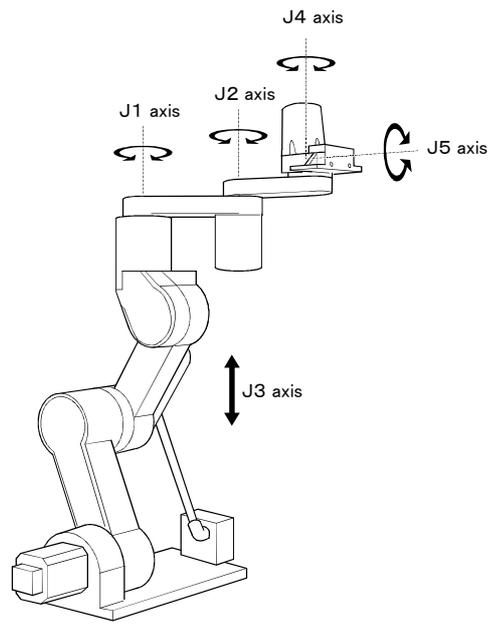
 **CAUTION** To immediately stop the robot, release the deadman switch on the back of the T/B. The servo power will turn OFF, and the robot will stop. The robot will also stop if the [EMG.STOP] switch (emergency stop switch) on the front of the T/B or the [EMG.STOP] switch (emergency stop) on the front of the controller is pressed.

 **CAUTION** Confirm that the origin has been set. If the origin has not been set, "\*\*\*\*" will appear at the current position display on the teaching pendant, the JOINT jog operation will take place in any jog mode selected. Refer to [Page 19, "2.3 Setting the origin"](#) for details on setting the origin.

<RH-1000GHDC-SA/GJDC-SA>

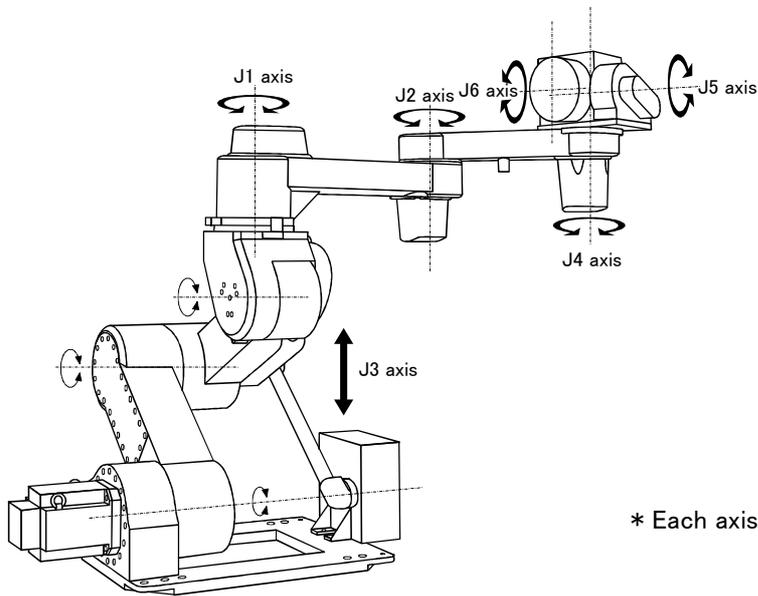


<RH-1000GHLC-SA/GJLC-SA>



Note) The J5 axis is provided only with the 5-axis type

<RH-1500G series>

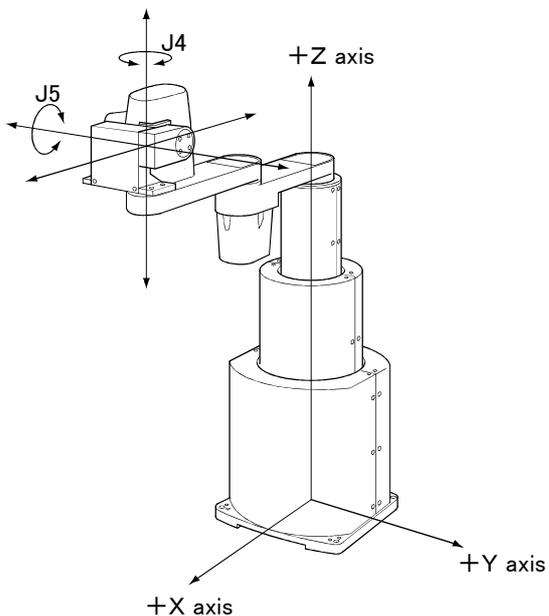


\* Each axis moves independently.

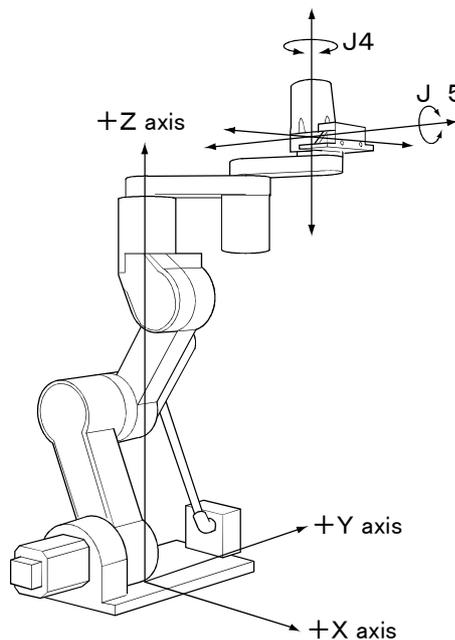
Note) The J6 axis is provided only with the 6-axis type

Fig.2-17 : JOINT jog operation

<RH-1000GHDC-SA/GJDC-SA>

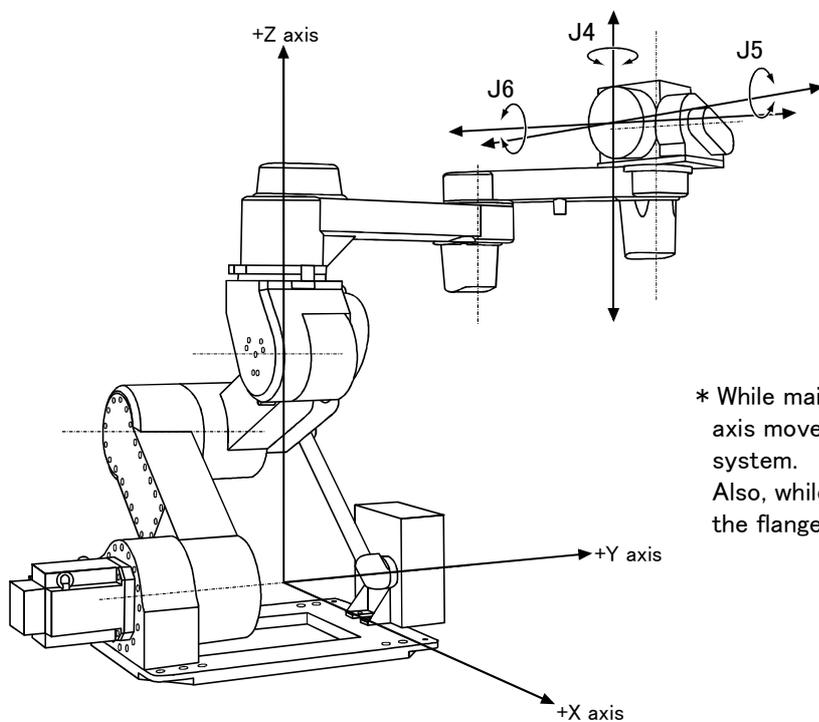


<RH-1000GHLC-SA/GJLC-SA>



Note) The Y-axis direction rotation is provided only with the 5-axis type.

<RH-1500G series>

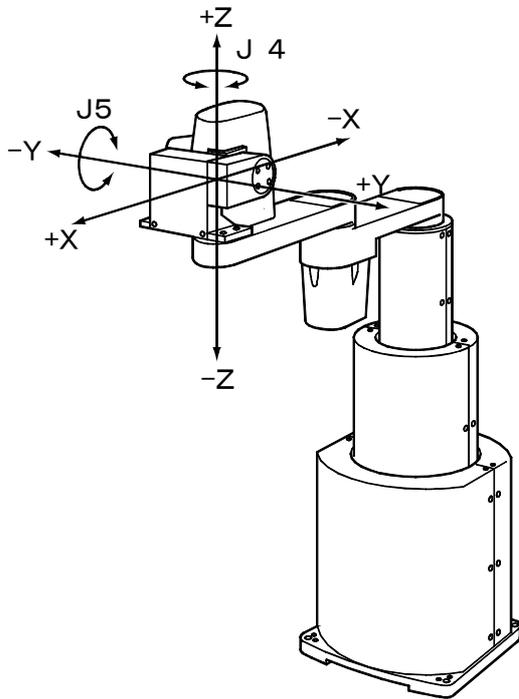


\* While maintaining the flange surface posture, the axis moves straight along the base coordinate system.  
Also, while maintaining the flange surface position, the flange surface posture changes.

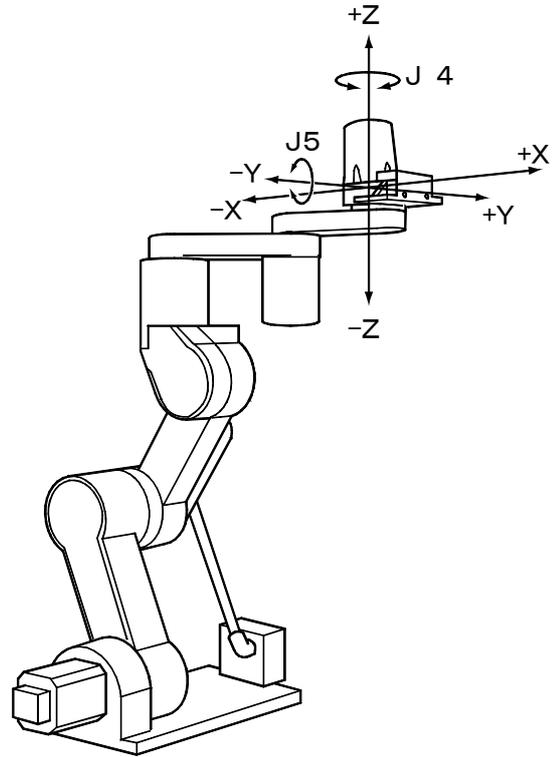
Note) The X-axis direction rotation is provided only with the 6-axis type.

Fig.2-18 : XYZ jog operation

<RH-1000GHDC-SA/GJDC-SA>

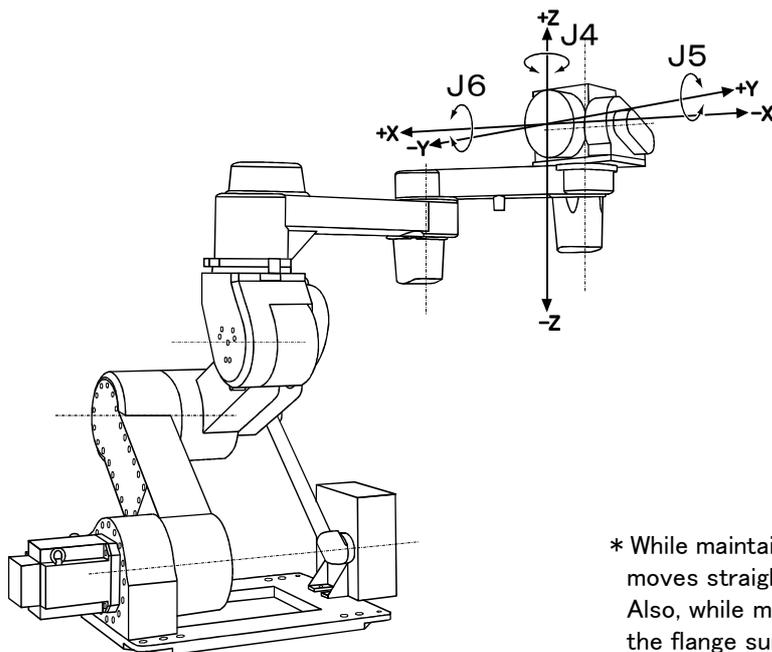


<RH-1000GHLC-SA/GJLC-SA>



Note) The Y-axis direction rotation is provided only with the 5-axis type.

<RH-1500G series>

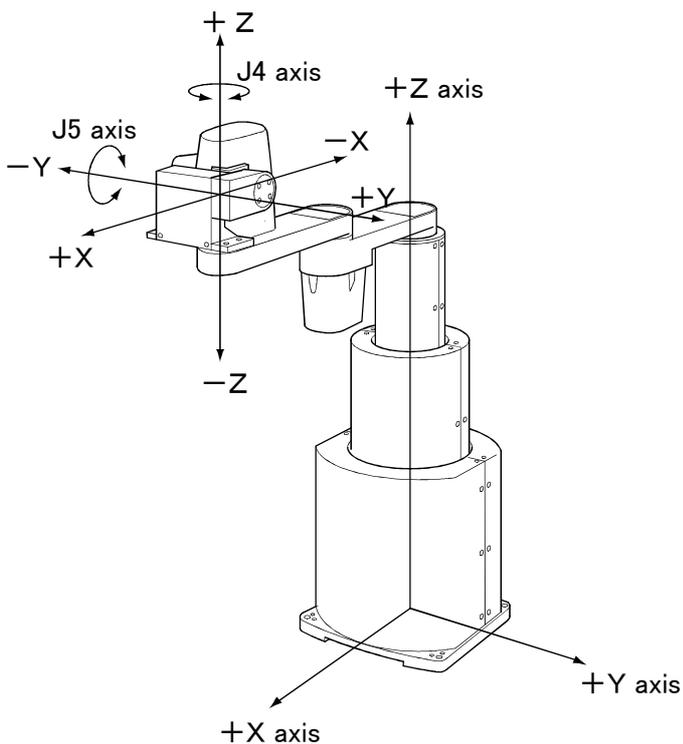


\* While maintaining the flange surface posture, the axis moves straight along the tool coordinate system. Also, while maintaining the flange surface position, the flange surface posture changes.

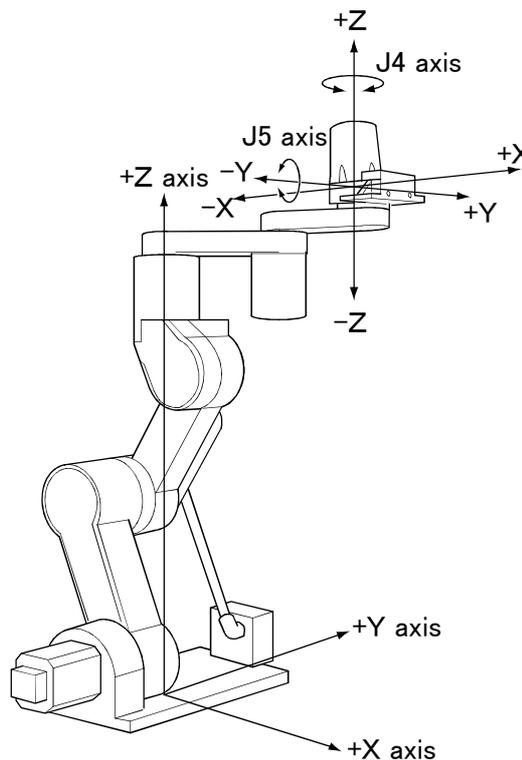
Note) The X-axis direction rotation is provided only with the 6-axis type.

Fig.2-19 : TOOL jog operation

<RH-1000GHDC-SA/GJDC-SA>

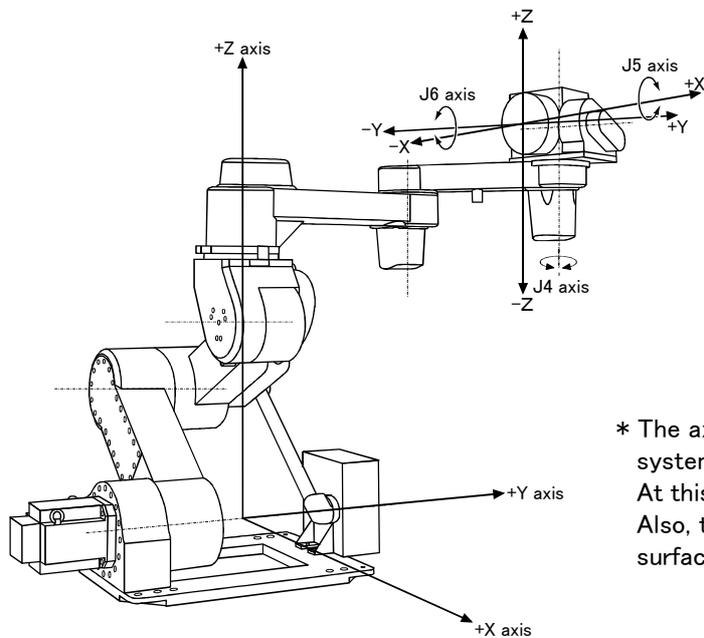


<RH-1000GHLC-SA/GJLC-SA>



Note) The J5 axis is provided only with the 5-axis type

<RH-1500G series>

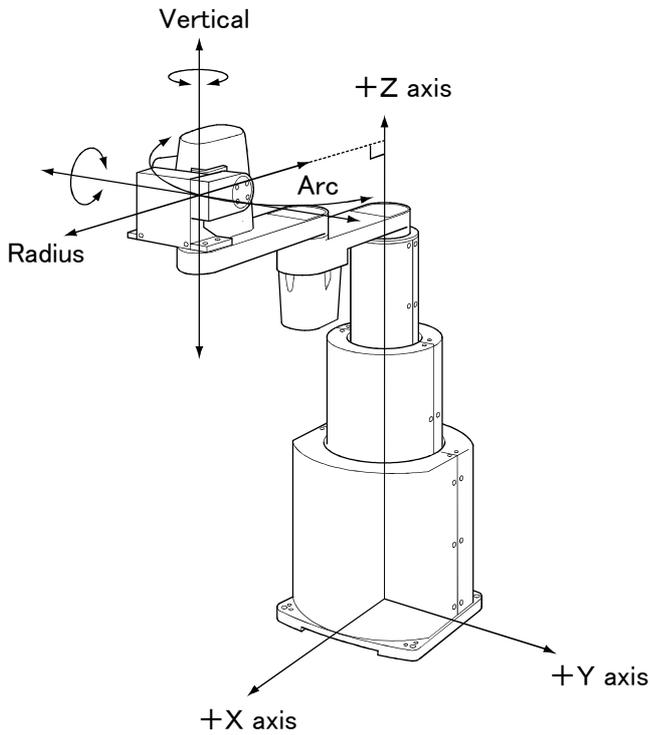


\* The axis moves straight along the base coordinate system.  
At this time, the flange surface posture is not maintained.  
Also, the flange surface posture changes. The flange surface position change at this time.

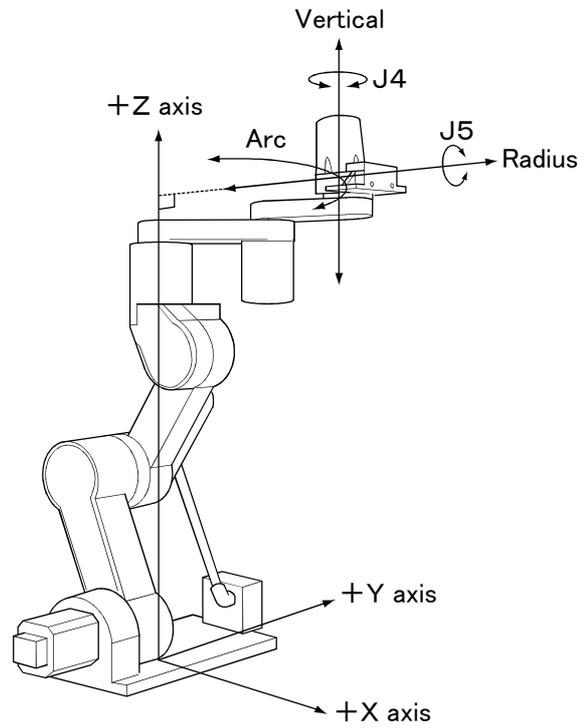
Note) The J6 axis is provided only with the 6-axis type

Fig.2-20 : 3-axis XYZ jog operation

<RH-1000GHDC-SA/GJDC-SA>

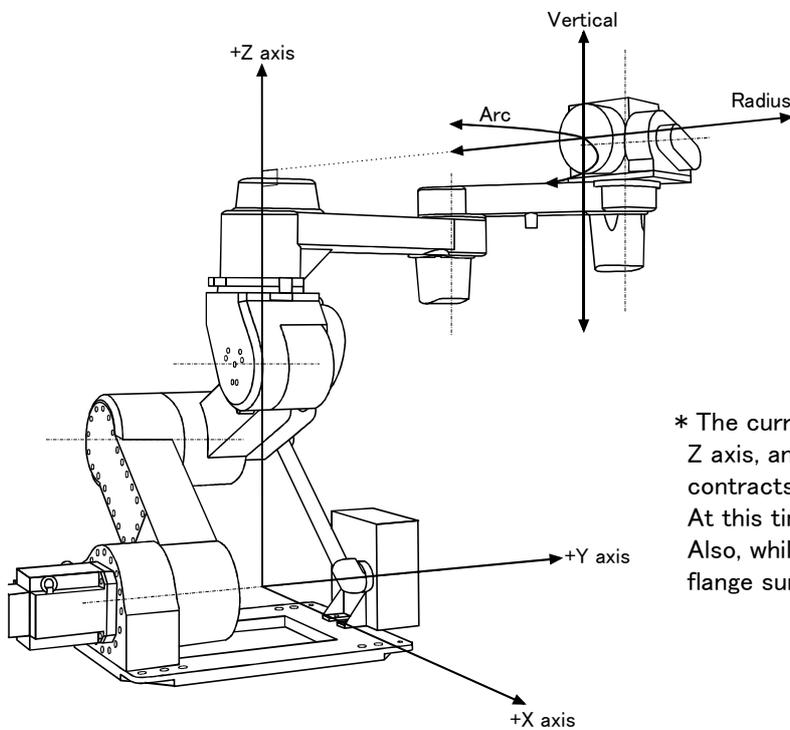


<RH-1000GHLC-SA/GJLC-SA>



Note) The Y-axis direction rotation is provided only with the 5-axis type.

<RH-1500G series>



\* The current position is set as the arc centering on the Z axis, and the axis moves along that arc, expands and contracts in the radius direction, and moves vertically. At this time, the flange surface posture is maintained. Also, while maintaining the flange surface position, the flange surface posture changes.

Note) The X-axis direction rotation is provided only with the 6-axis type.

Fig.2-21 : CYLINDER jog operation

(1) JOINT jog operation

Select the JOINT jog mode

JOINT	LOW
J1	+34.50
J2	+20.00
J3	+80.00

JOINT jog mode

STEP  
MOVE

 + 

JOINT  
(?)

Press the [MOVE] + [JOINT] keys to select the JOINT jog mode. "JOINT" will appear at the upper left of the screen.

Set the jog speed

JOINT	LOW
J1	+34.50
J2	+20.00
J3	+80.00

Set the speed

STEP  
MOVE

 + 

+

FORWD

-

BACKWD

Each time the [MOVE] + [+] keys are pressed, the override will increase in the order of LOW → HIGH → 3 → 5 → 10 → 30 → 50 → 70 → 100%.

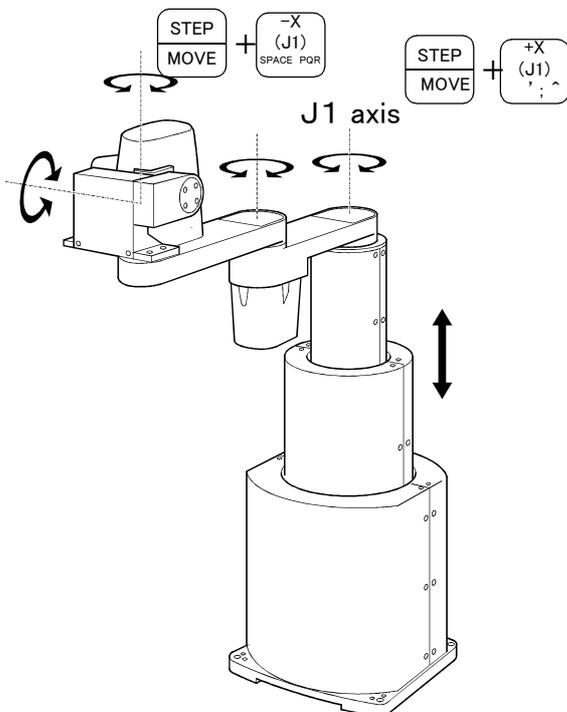
When the [MOVE] + [-] keys are pressed, the override will decrease in the reverse order.

The currently set speed will appear on the upper right of the screen.

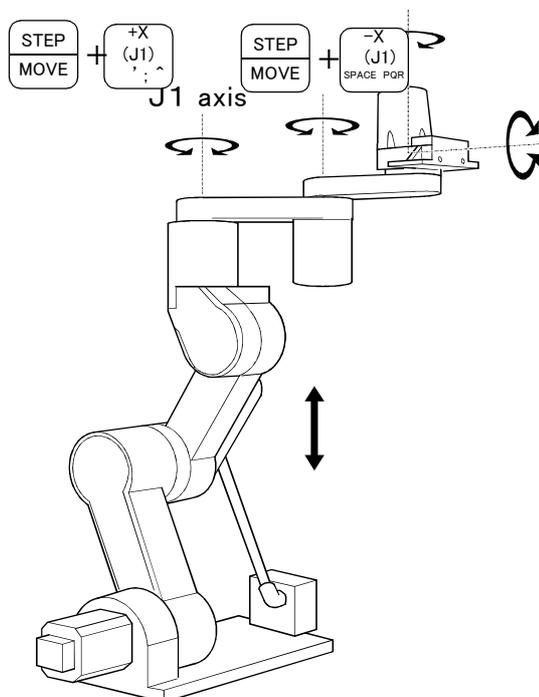
Set the override to 10% here for confirmation work.

J1 axis jog operation

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>



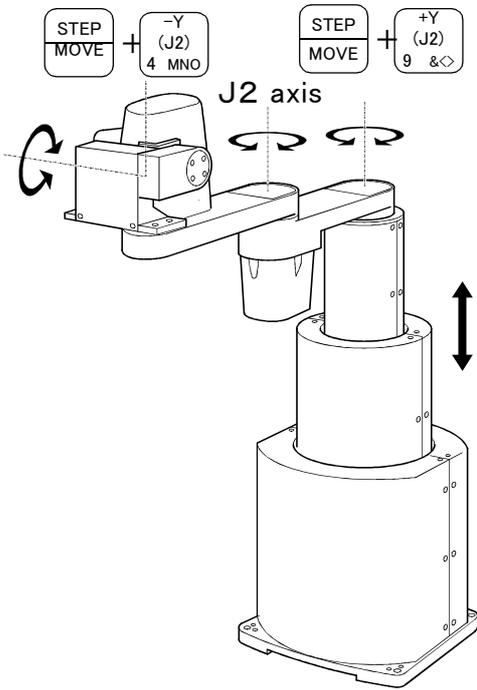
When the [MOVE] + [+X (J1)] keys are pressed, the J1 axis will rotate in the plus direction.  
When the [MOVE] + [-X (J1)] keys are pressed, the J1 axis will rotate in the minus direction.

◆◆◆ When the robot is in the transportation posture ◆◆◆

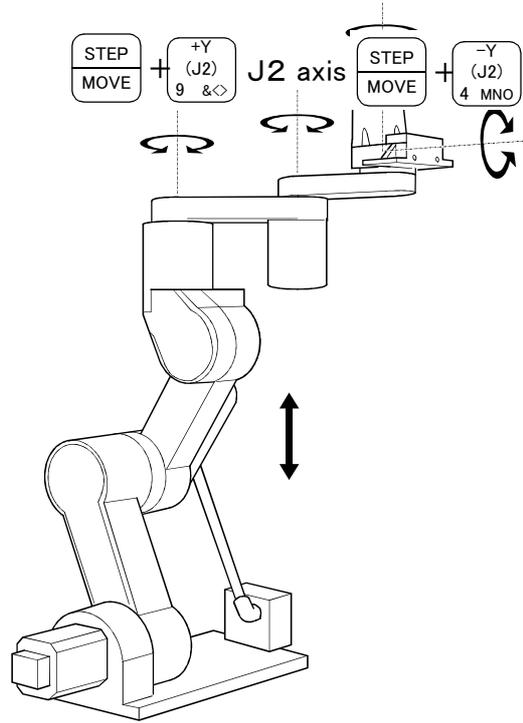
The axes may be outside the movement area. Move these axes toward the inner side of the movement area. If moved outward, an  will appear on the T/B screen, and the robot will not move.

J2 axis jog operation

<RH-1000GHDC-SA/GJDC-SA>



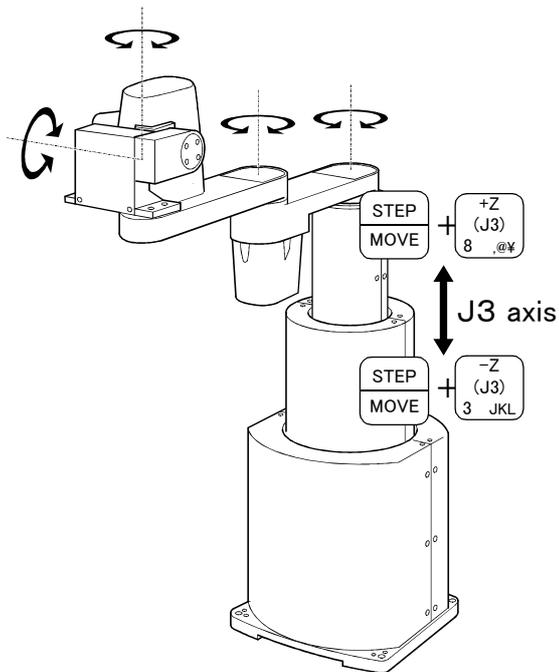
<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>



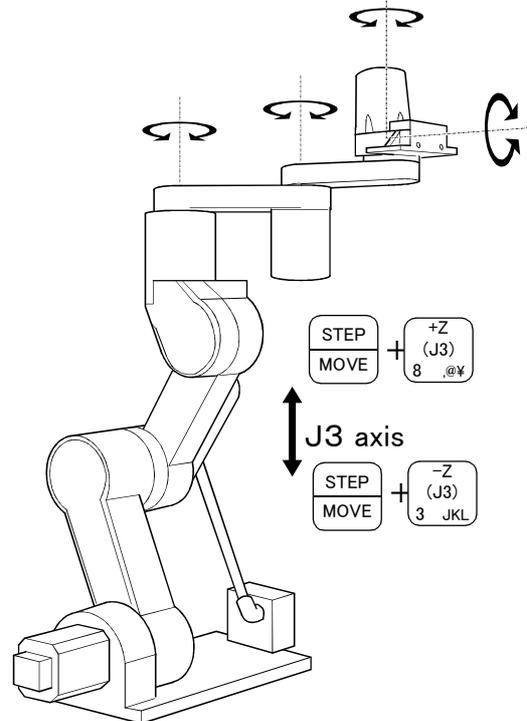
When the [MOVE] + [+Y (J2)] keys are pressed, the J2 axis will rotate in the plus direction.  
 When the [MOVE] + [-Y (J2)] keys are pressed, the J2 axis will rotate in the minus direction.

J3 axis jog operation

<RH-1000GHDC-SA/GJDC-SA>



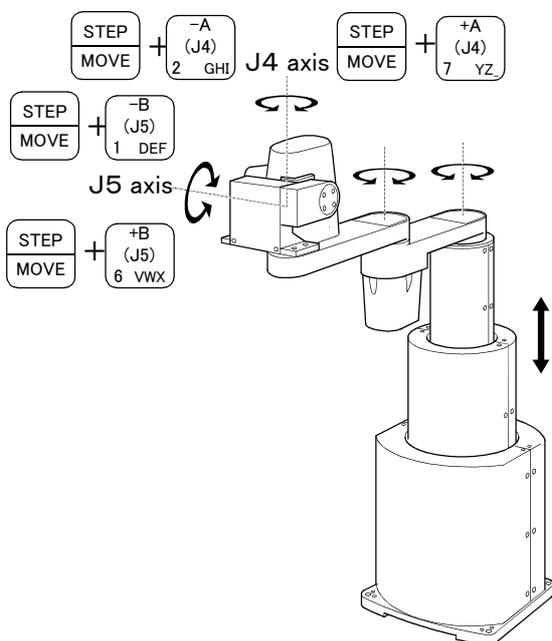
<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>



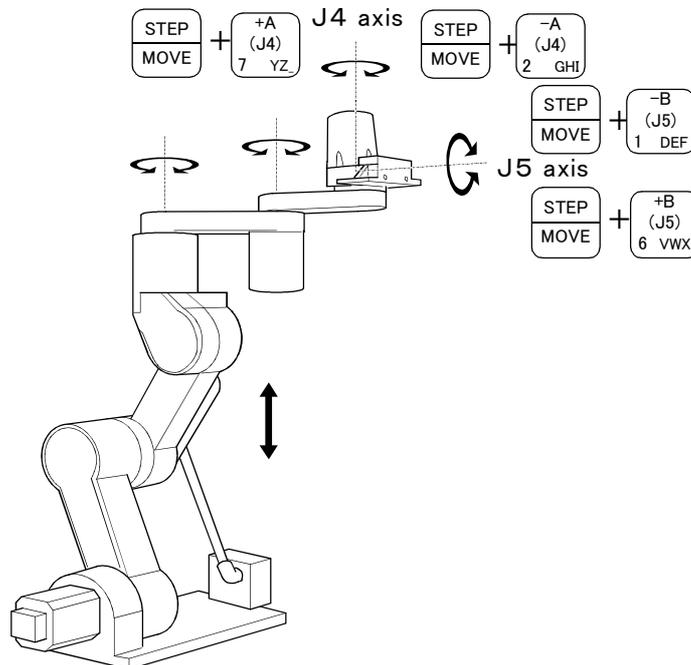
When the [MOVE] + [+Z (J3)] keys are pressed, the J3 axis will rotate in the plus direction (up).  
 When the [MOVE] + [-Z (J3)] keys are pressed, the J3 axis will rotate in the minus direction (down).

## J4, J5, J6 axis jog operation

&lt;RH-1000GHDC-SA/GJDC-SA&gt;

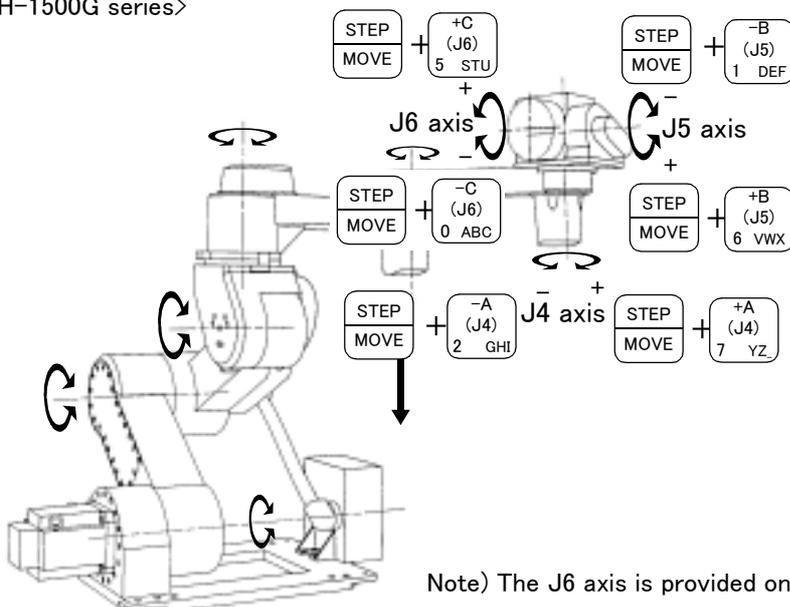


&lt;RH-1000GHLC-SA/GJLC-SA&gt;



Note) The J5 axis is provided only with the 5-axis type

&lt;RH-1500G series&gt;



Note) The J6 axis is provided only with the 6-axis type

When the [MOVE] + [+A (J4)] keys are pressed, the J4 axis will rotate in the plus direction.  
 When the [MOVE] + [-A (J4)] keys are pressed, the J4 axis will rotate in the minus direction.

When the [MOVE] + [+B (J5)] keys are pressed, the J4 axis will rotate in the plus direction.  
 When the [MOVE] + [-B (J5)] keys are pressed, the J4 axis will rotate in the minus direction.  
 (Only RH-1000G series 5-axis type, and RH-1500G series.)

When the [MOVE] + [+C (J6)] keys are pressed, the J6 axis will rotate in the plus direction.  
 When the [MOVE] + [-C (J6)] keys are pressed, the J6 axis will rotate in the minus direction.  
 (Only RH-1500G series 6-axis type.)

◇◆◇ When an  appears on the T/B screen display ◇◆◇

If the robot is moved outside the movement area, an  will appear. In this case, move the axis in the opposite direction.

JOINT	LOW
<input checked="" type="checkbox"/> J1	+160.00
J2	+20.00
J3	+80.00

In the example on the left, the J1 axis is at the limit of the plus side movement area.

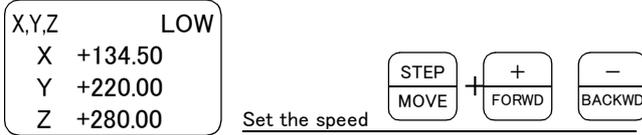
(2) XYZ jog operation

Select the XYZ jog mode



Press the [MOVE] + [XYZ] keys to select the XYZ jog mode. "XYZ" will appear at the upper left of the screen.

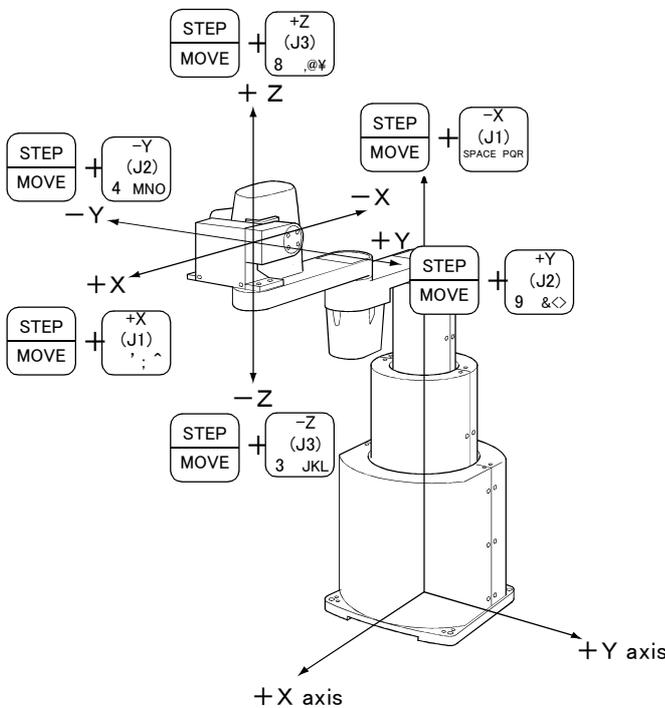
Set the jog speed



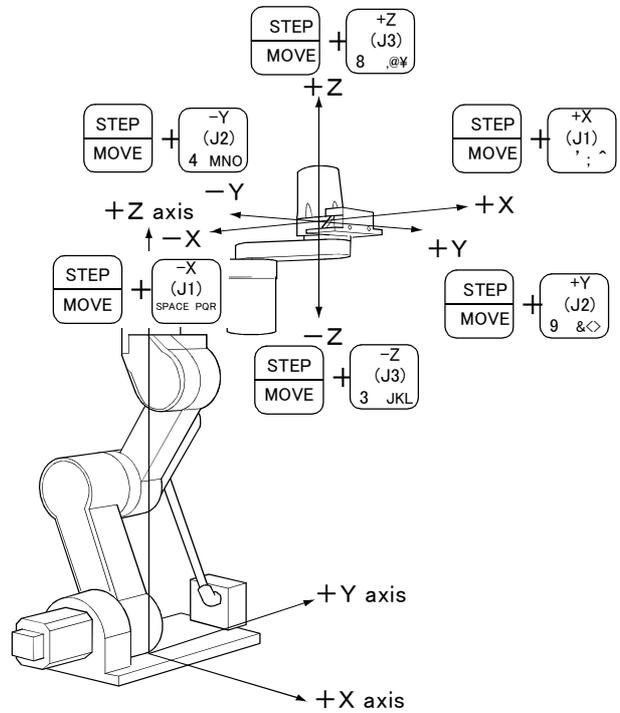
Each time the [MOVE] + [+] keys are pressed, the override will increase in the order of LOW → HIGH → 3 → 5 → 10 → 30 → 50 → 70 → 100%. When the [MOVE] + [-] keys are pressed, the override will decrease in the reverse order. The currently set speed will appear on the upper right of the screen. Set the override to 10% here for confirmation work.

Moving along the base coordinate system

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLc-SA/GJLC-SA, RH-1500G series>



- \* Moving along the X axis  
When the [MOVE] + [+X (J1)] keys are pressed, the robot will move along the X axis plus direction.  
When the [MOVE] + [-X (J1)] keys are pressed, the robot will move along the minus direction.
- \* Moving along the Y axis  
When the [MOVE] + [+Y(J2)] keys are pressed, the robot will move along the Y axis plus direction.  
When the [MOVE] + [-Y (J2)] keys are pressed, the robot will move along the minus direction.
- \* Moving along the Z axis  
When the [MOVE] + [+Z (J3)] keys are pressed, the robot will move along the Z axis plus direction.  
When the [MOVE] + [-Z (J3)] keys are pressed, the robot will move along the minus direction.

◆◆◆ When the robot is in the transportation posture ◆◆◆

There are directions from which linear movement is not possible from the transportation posture. In this case, an **✘** will appear on the T/B screen, and the robot will not move. Refer to section [Page 31, "\(1\) JOINT jog operation"](#), and move the robot to a position where linear movement is possible, and then carry out XYZ jog.

◆◆◆ When an  appears on the T/B screen display ◆◆◆

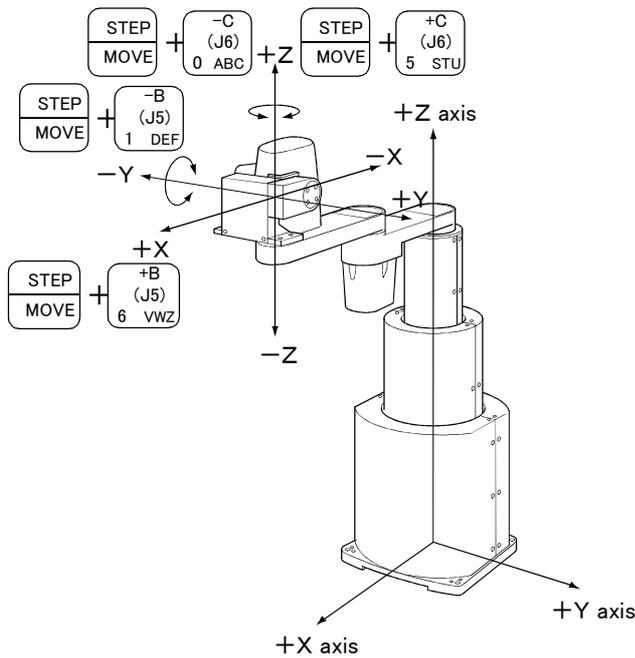
If the robot is moved outside the movement area with any of the axes, an  will appear. In this case, move the axis in the opposite direction.

XYZ	LOW
<input checked="" type="checkbox"/> X	+360.00
<input checked="" type="checkbox"/> Y	+280.00
<input checked="" type="checkbox"/> Z	+170.00

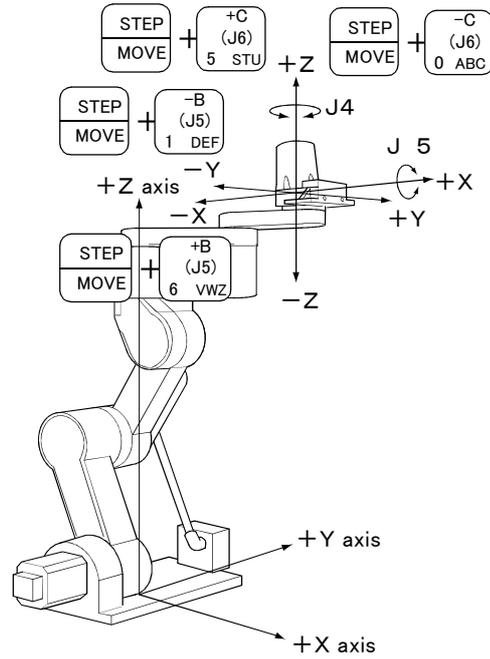
In the example on the left, further linear movement in the same direction is not possible.

Changing the flange surface posture

<RH-1000GHDC-SA/GJDC-SA>

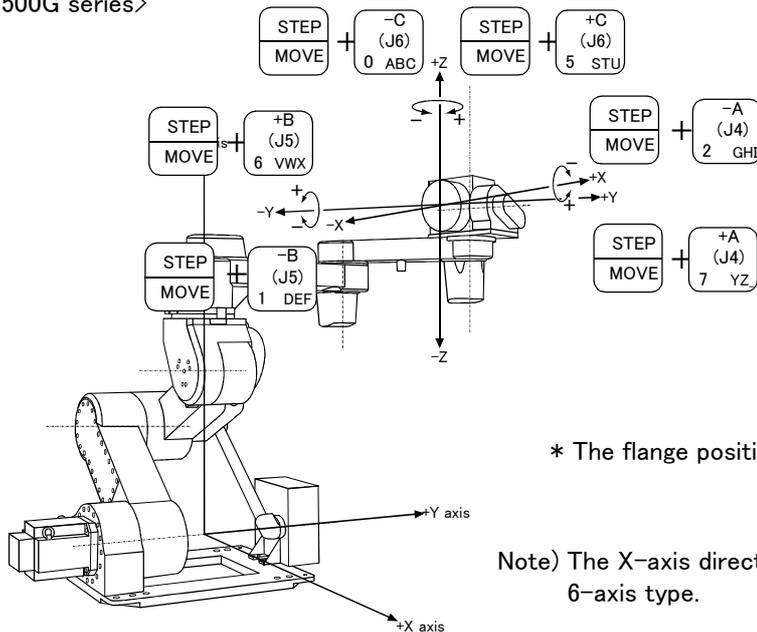


<RH-1000GHLC-SA/GJLC-SA>



Note) The Y-axis direction rotation is provided only with the 5-axis type.

<RH-1500G series>



\* The flange position does not change.

Note) The X-axis direction rotation is provided only with the 6-axis type.

\* Rotating around the X axis(Only RH-1500G series 6-axis type.)

When the [MOVE] + [+A (J4)] keys are pressed, the X axis will rotate in the plus direction.

When the [MOVE] + [-A (J4)] keys are pressed, the X axis will rotate in the minus direction.

\* Rotating around the Y axis (Only RH-1000G series 5-axis-type, and RH-1500G series.)

When the [MOVE] + [+B (J5)] keys are pressed, the Y axis will rotate in the plus direction.

When the [MOVE] + [-B (J5)] keys are pressed, the Y axis will rotate in the minus direction.

\* Rotating around the Z axis

When the [MOVE] + [+C (J6)] keys are pressed, the Z axis will rotate in the plus direction.

When the [MOVE] + [-C (J6)] keys are pressed, the Z axis will rotate in the minus direction.

◆◆◆ When alarm No.5150 occurs ◆◆◆

If alarm No. 5150 (ORIGIN NOT SET) occurs, the origin has not been set correctly. Reconfirm the value input for the origin data.

◆◆◆ Tool length ◆◆◆

The default tool length is 0mm, and the control point is the center of the end axis.

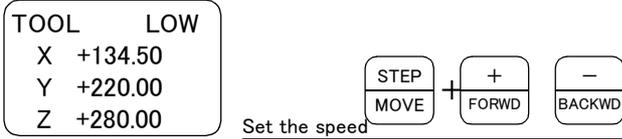
After installing the hand, set the correct tool length in the parameters. Refer to the separate manual "Detailed Explanation of Functions and Operations" for details.

(3) TOOL jog operation

Select the TOOL jog mode



Set the jog speed

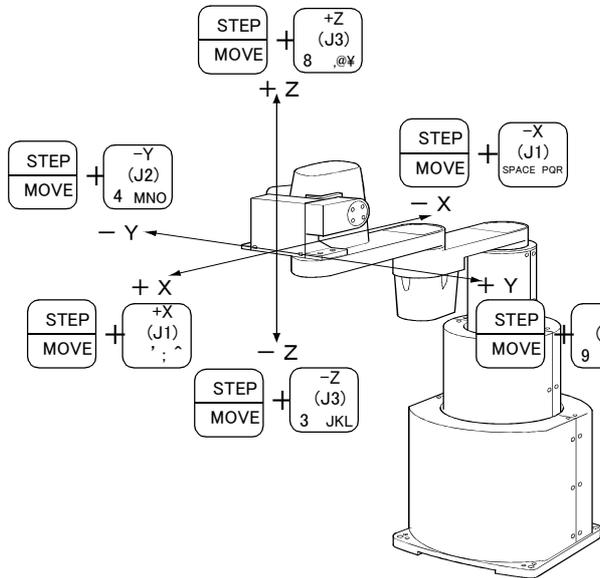


Press the [MOVE] + [TOOL] keys to select the TOOL jog mode. "TOOL" will appear at the upper left of the screen.

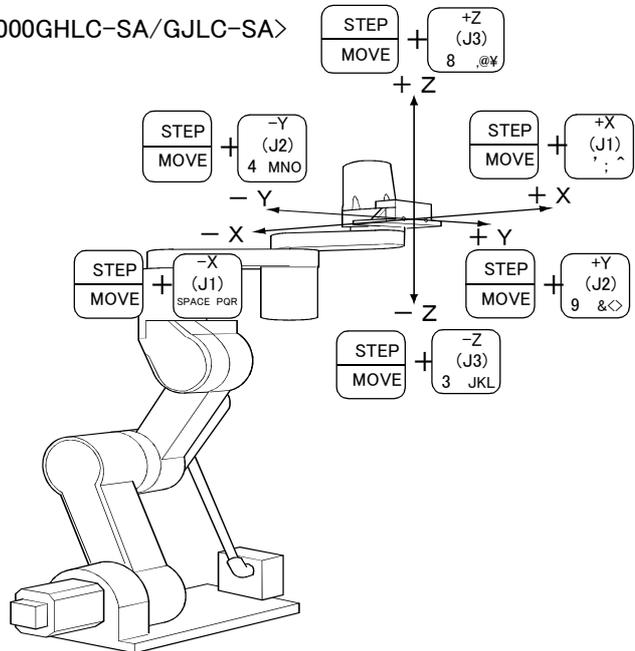
Each time the [MOVE] + [+] keys are pressed, the override will increase in the order of LOW → HIGH → 3 → 5 → 10 → 30 → 50 → 70 → 100%. When the [MOVE] + [-] keys are pressed, the override will decrease in the reverse order. The currently set speed will appear on the upper right of the screen. Set the override to 10% here for confirmation work.

The axis moves along the tool coordinate system.

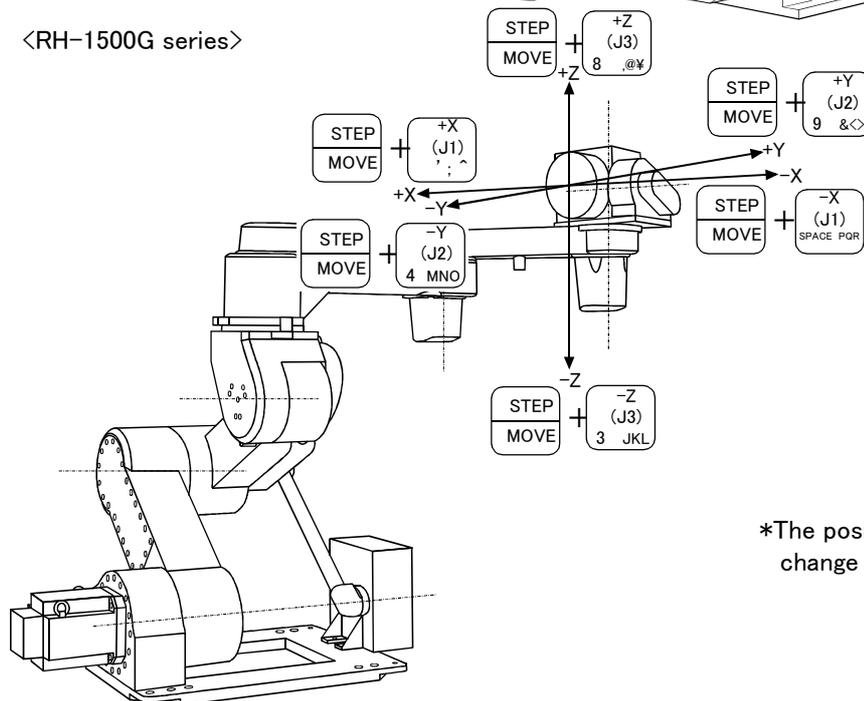
<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA>



<RH-1500G series>



\*The position of the flange does not change into each model.

\* Moving along the X axis(Only RH-1500G series 6-axis type.)

When the [MOVE] + [+X (J1)] keys are pressed, the robot will move along the X axis plus direction of the tool coordinate system.

When the [MOVE] + [-X (J1)] keys are pressed, the robot will move along the minus direction.

\* Moving along the Y axis(RH-1000G series is only 5-axis type.)

When the [MOVE] + [+Y(J2)] keys are pressed, the robot will move along the Y axis plus direction of the tool coordinate system.

When the [MOVE] + [-Y (J2)] keys are pressed, the robot will move along the minus direction.

\* Moving along the Z axis

When the [MOVE] + [+Z (J3)] keys are pressed, the robot will move along the Z axis plus direction of the tool coordinate system.

When the [MOVE] + [-Z (J3)] keys are pressed, the robot will move along the minus direction.

◇◆◇ When the robot is in the transportation posture ◇◆◇

There are directions from which linear movement is not possible from the transportation posture. In this case, an  will appear on the T/B screen, and the robot will not move. Refer to section [Page 31, "\(1\) JOINT jog operation"](#), and move the robot to a position where linear movement is possible, and then carry out TOOL jog.

◇◆◇ When an  appears on the T/B screen display ◇◆◇

If the robot is moved outside the movement area with any of the axes, an  will appear. In this case, move the axis in the opposite direction.

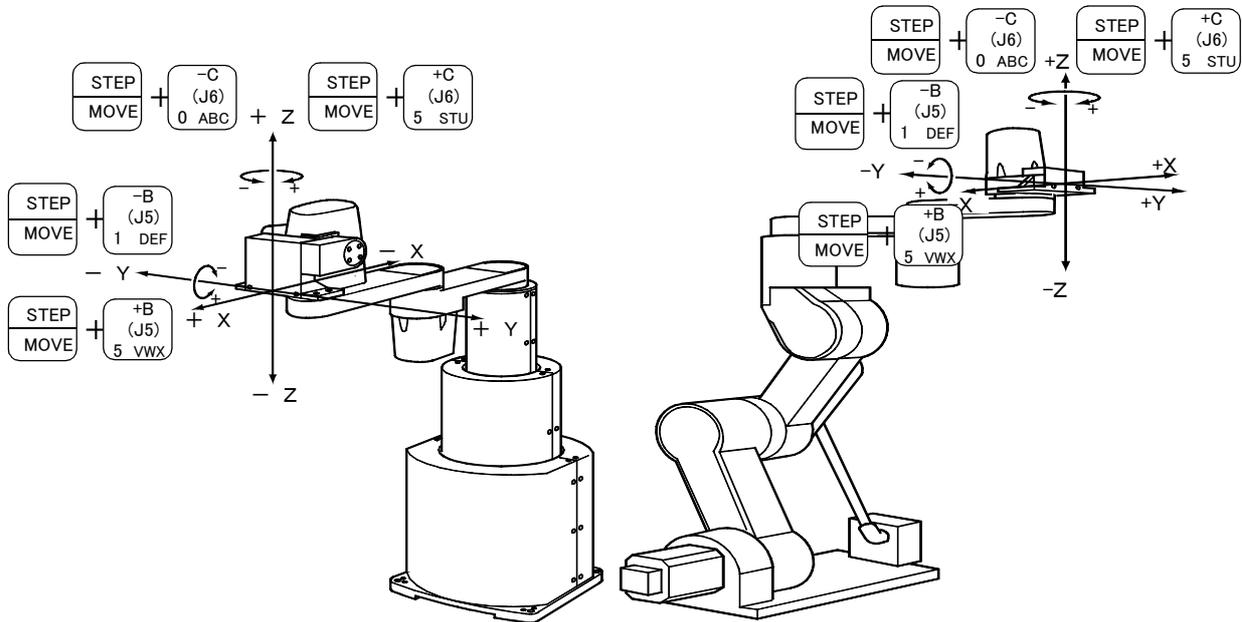
TOOL	LOW
<input checked="" type="checkbox"/> X	+360.00
<input checked="" type="checkbox"/> Y	+280.00
<input checked="" type="checkbox"/> Z	+170.00

In the example on the left, further linear movement in the same direction is not possible.

Changing the flange surface posture

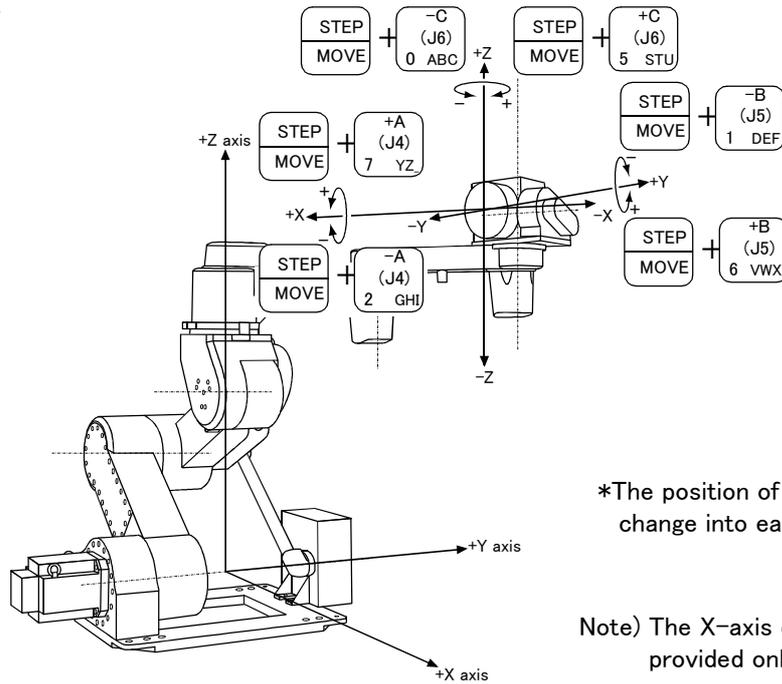
<RH-1000GHDC-SA/GJDC-SA>

<RH-1000GHLC-SA/GJLC-SA>



Note) The Y-axis direction rotation is provided only with the 5-axis type.

<RH-1500G series>



\*The position of the flange does not change into each model.

Note) The X-axis direction rotation is provided only with the 6-axis type.

- \* Rotating around the X axis(Only RH-1500G series 6-axis type.)  
 When the [MOVE] + [+A (J4)] keys are pressed, the X axis will rotate in the plus direction of the tool coordinate system.  
 When the [MOVE] + [-A (J4)] keys are pressed, the X axis will rotate in the minus direction.
- \* Rotating around the Y axis(Only RH-1000G series 5-axis type and RH-1500G series.)  
 When the [MOVE] + [+B (J5)] keys are pressed, the Y axis will rotate in the plus direction of the tool coordinate system.  
 When the [MOVE] + [-B (J5)] keys are pressed, the Y axis will rotate in the minus direction.

\* Rotating around the Z axis

When the [MOVE] + [+C (J6)] keys are pressed, the Z axis will rotate in the plus direction of the tool coordinate system.

When the [MOVE] + [-C (J6)] keys are pressed, the Z axis will rotate in the minus direction.

◇◆◇ When alarm No.5150 occurs ◇◆◇

If alarm No. 5150 (ORIGIN NOT SET) occurs, the origin has not been set correctly. Reconfirm the value input for the origin data.

◇◆◇ Tool length ◇◆◇

The default tool length is 0mm, and the control point is the center of the end axis.

After installing the hand, set the correct tool length in the parameters. Refer to the separate manual "Detailed Explanation of Functions and Operations" for details.

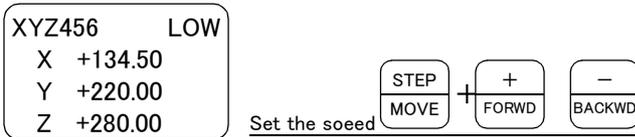
(4) 3-axis XYZ jog operation

Select the 3-axis XYZ jog mode



Press the [MOVE] + [XYZ] keys, and then press only the [XYZ] key. "XYZ456" will appear at the upper left of the screen.

Set the jog speed

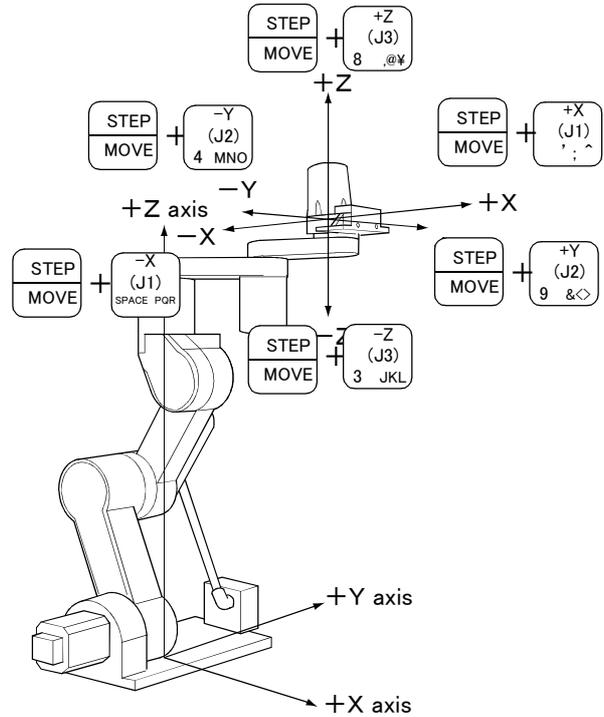
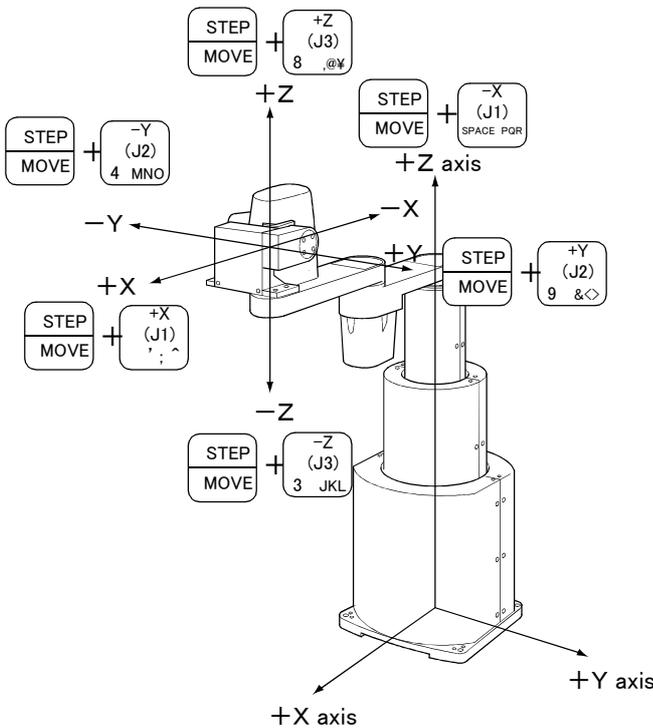


Each time the [MOVE] + [+] keys are pressed, the override will increase in the order of LOW → HIGH → 3 → 5 → 10 → 30 → 50 → 70 → 100%. When the [MOVE] + [-] keys are pressed, the override will decrease in the reverse order. The currently set speed will appear on the upper right of the screen. Set the override to 10% here for confirmation work.

Moving along the base coordinate system

<RH-1000GHDC-SA/GJDC-SA>

<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>



\*The position of the flange does change into each model.

\* Moving along the X axis

When the [MOVE] + [+X (J1)] keys are pressed, the robot will move along the X axis plus direction.  
When the [MOVE] + [-X (J1)] keys are pressed, the robot will move along the minus direction.

\* Moving along the Y axis

When the [MOVE] + [+Y(J2)] keys are pressed, the robot will move along the Y axis plus direction.  
When the [MOVE] + [-Y (J2)] keys are pressed, the robot will move along the minus direction.

\* Moving along the Z axis

When the [MOVE] + [+Z (J3)] keys are pressed, the robot will move along the Z axis plus direction.  
When the [MOVE] + [-Z (J3)] keys are pressed, the robot will move along the minus direction.

◇◆◇ Jog mode will change when only [XYZ] key is pressed again ◇◆◇

When the [MOVE] + [XYZ] keys are pressed and then only the [XYZ] key is pressed, the upper left display will change in the order of "XYZ" → "XYZ456" → "CYLNDER". Each jog mode can be selected.

◇◆◇ The flange surface end axis posture cannot be maintained with 3-axis XYZ jog. ◇◆◇

With 3-axis XYZ jog, the flange surface end axis posture (orientation) is not maintained when moving linearly in the X, Y or Z axis direction.

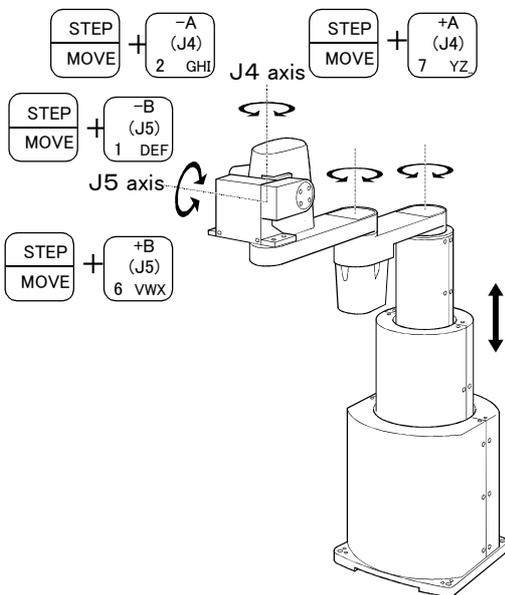
Use XYZ jog to maintain the posture.

◇◆◇ When alarm No.5150 occurs ◇◆◇

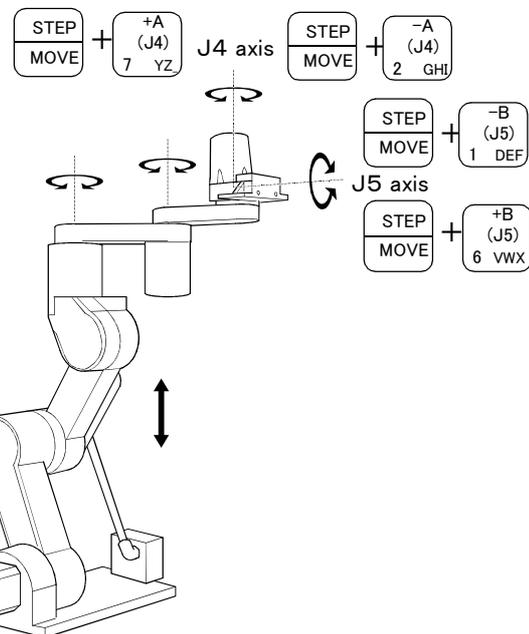
If alarm No. 5150 (ORIGIN NOT SET) occurs, the origin has not been set correctly. Reconfirm the value input for the origin data.

Changing the flange surface posture

<RH-1000GHDC-SA/GJDC-SA>

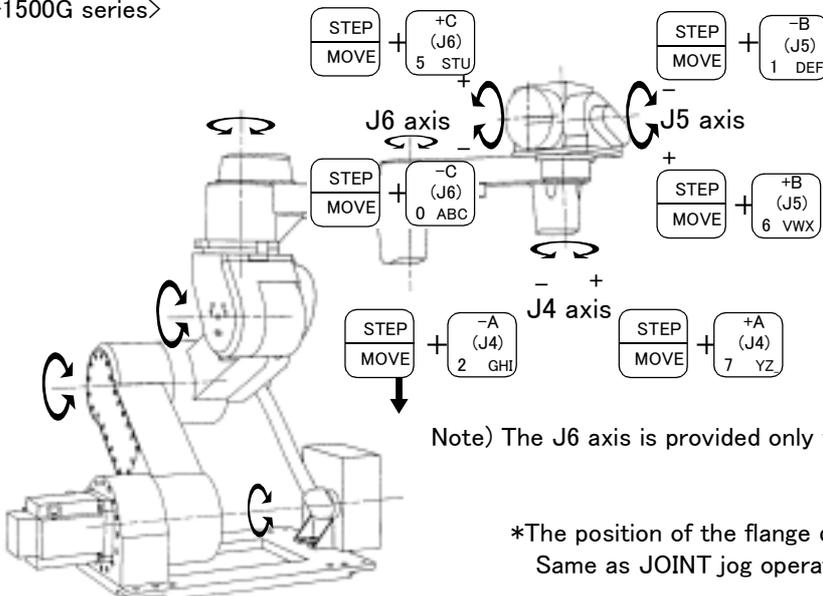


<RH-1000GHLC-SA/GJLC-SA>



Note) The J5 axis is provided only with the 5-axis type.

<RH-1500G series>



Note) The J6 axis is provided only with the 6-axis type.

\*The position of the flange does change into each model. Same as JOINT jog operation of J4, J5, or J6 axis.

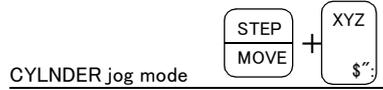
When the [MOVE] + [+A (J4)] keys are pressed, the robot will move along the J4 axis plus direction.  
When the [MOVE] + [-A (J4)] keys are pressed, the robot will move along the minus direction.

When the [MOVE] + [+B (J5)] keys are pressed, the robot will move along the J5 axis plus direction.  
When the [MOVE] + [-B (J5)] keys are pressed, the robot will move along the minus direction.

When the [MOVE] + [+C (J6)] keys are pressed, the robot will move along the J6 axis plus direction.  
When the [MOVE] + [-C (J6)] keys are pressed, the robot will move along the minus direction.  
(Only RH-1500G series 6-axis type.)

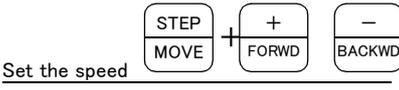
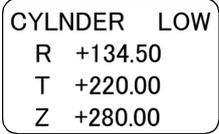
(5) CYLINDER jog operation

Select the cylindrical jog mode



Press the [MOVE] + [XYZ] keys, and then press only the [XYZ] key. "CYLINDER" will appear at the upper left of the screen.

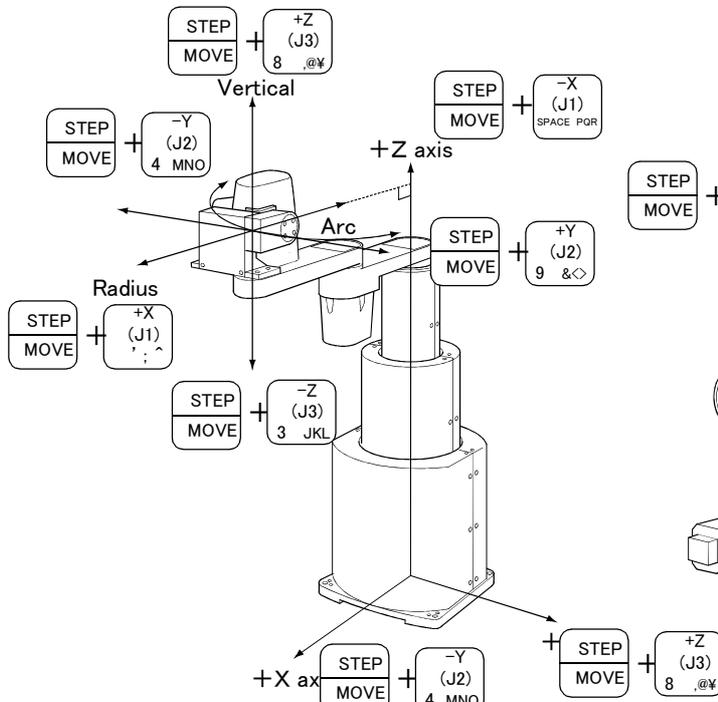
Set the jog speed



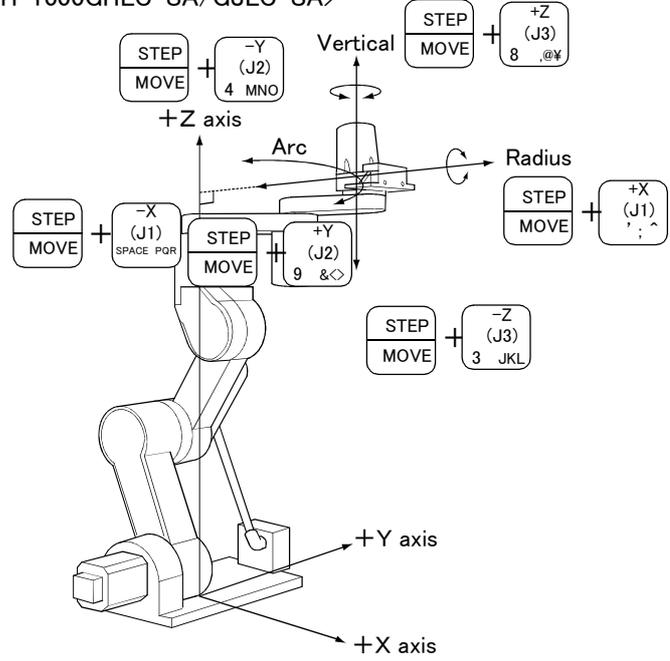
Each time the [MOVE] + [+] keys are pressed, the override will increase in the order of LOW → HIGH → 3 → 5 → 10 → 30 → 50 → 70 → 100%. When the [MOVE] + [-] keys are pressed, the override will decrease in the reverse order. The currently set speed will appear on the upper right of the screen. Set the override to 10% here for confirmation work.

Moving along an arc centering on the Z axis

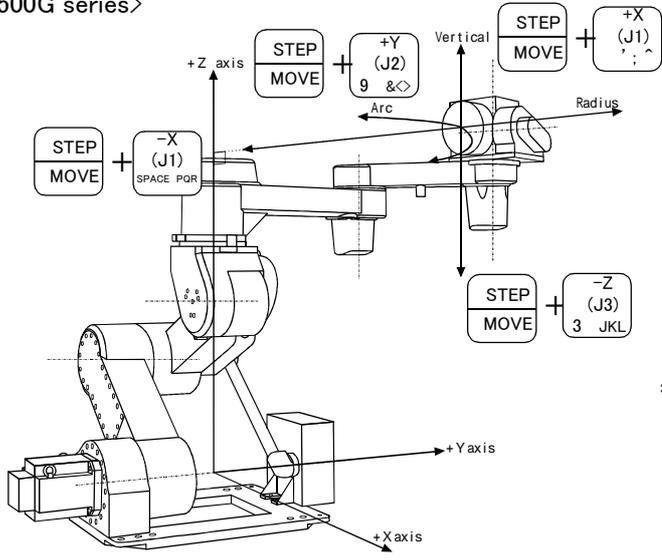
<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA>



<RH-1500G series>



\*The flange surface posture is maintained into each model.

\* Moving along an arc

Assuming that the current position is on an arc centering on the Z axis, the robot moves along that arc.  
When the [MOVE] + [+Y (J2)] keys are pressed, the robot will move along the arc in the plus direction.  
When the [MOVE] + [-Y (J2)] keys are pressed, the robot will move in the minus direction.

\* Moving in the radial direction

Assuming that the current position is on an arc centering on the Z axis, the robot will expand and contract in the radial direction.  
When the [MOVE] + [+X (J1)] keys are pressed, the robot will expand in the radial direction.  
When the [MOVE] + [-X (J1)] keys are pressed, the robot will contract in the radial direction.

\* Moving along the Z axis

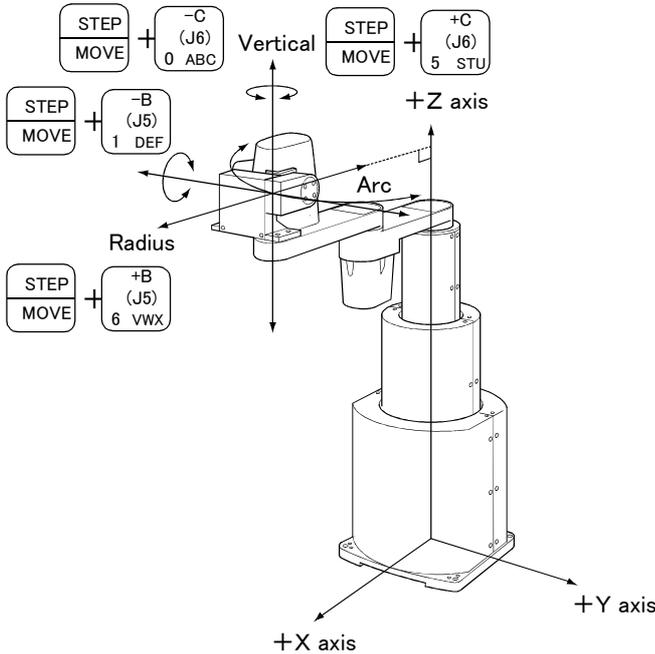
When the [MOVE] + [+Z (J3)] keys are pressed, the robot will move along the Z axis plus direction.  
When the [MOVE] + [-Z (J3)] keys are pressed, the robot will move along the minus direction.

◆◆◆ When alarm No.5150 occurs ◆◆◆

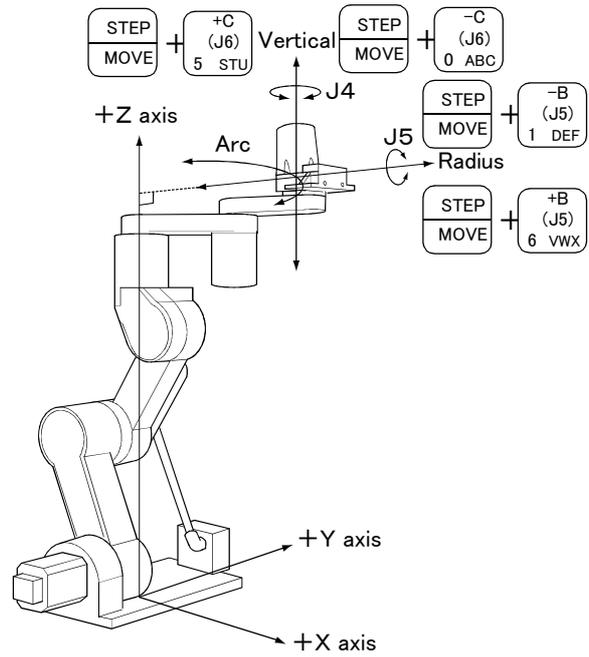
If alarm No. 5150 (ORIGIN NOT SET) occurs, the origin has not been set correctly. Reconfirm the value input for the origin data.

Changing the flange surface posture

<RH-1000GHDC-SA/GJDC-SA>

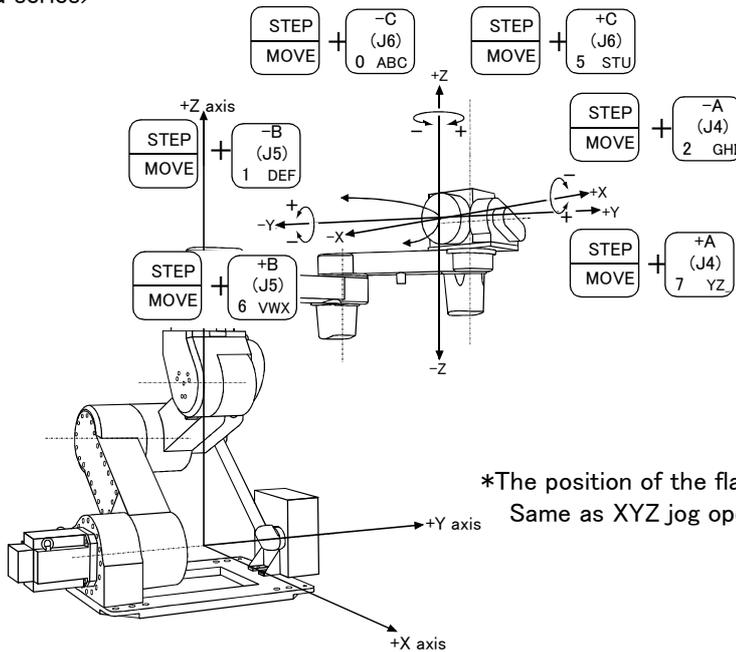


<RH-1000GHLC-SA/GJLC-SA>



Note) The Y-axis direction rotation is provided only with the 5-axis type.

<RH-1500G series>



\*The position of the flange does not change into each model. Same as XYZ jog operation of A, B, or C axis.

Note) The X-axis direction rotation is provided only with the 6-axis type.

\* Rotating around the X axis(Only RH-1500G series 6-axis type.)

When the [MOVE] + [+A (J4)] keys are pressed, the X axis will rotate in the plus direction.  
When the [MOVE] + [-A (J4)] keys are pressed, the X axis will rotate in the minus direction.

\*Rotating around the Y axis (Only RH-1000G series 5-axis type and RH-1500G series.)

When the [MOVE] + [+B (J5)] keys are pressed, the Y axis will rotate in the plus direction.  
When the [MOVE] + [-B (J5)] keys are pressed, the Y axis will rotate in the minus direction.

\* Rotating around the Z axis

When the [MOVE] + [+C (J6)] keys are pressed, the Z axis will rotate in the plus direction.  
When the [MOVE] + [-C (J6)] keys are pressed, the Z axis will rotate in the minus direction.



### 3 Installing the option devices

Refer to the standard specifications, and install the above options are needed.



## 4 Basic operations

The basic operations from creating the program to automatic operation are explained in section "4. Basic operations" in the "From Controller Setup to Maintenance" manual. Refer that manual as necessary.



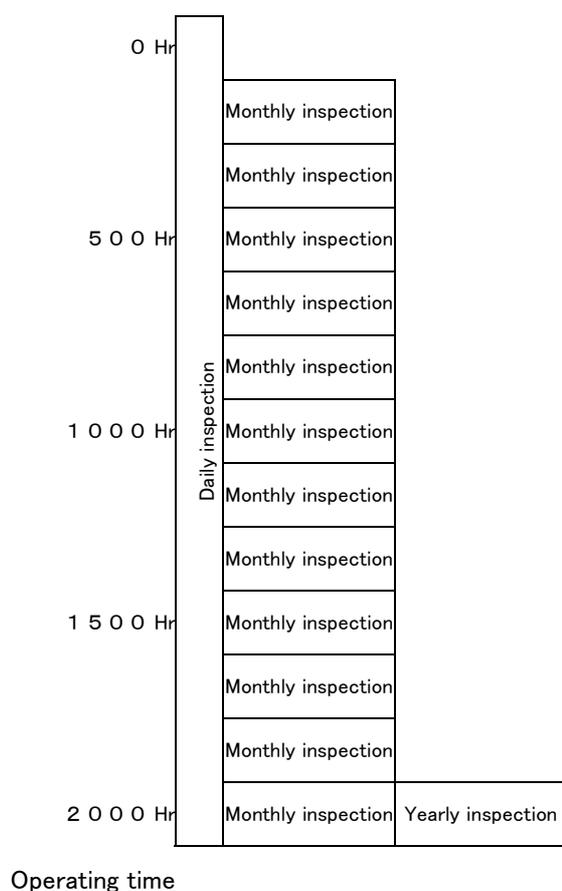
## 5 Maintenance and Inspection

The maintenance and inspection procedures to be carried out to use the robot for a long time without trouble are described in this chapter. The types and replacement methods of consumable parts are also explained.

### 5.1 Maintenance and inspection interval

Maintenance and inspection are divided into the inspections carried out daily, and the periodic inspections carry out at set intervals. Always carry these out to prevent unforeseen trouble, to maintain the product for a long time, and to secure safety.

#### (1) Inspection schedule



<Guideline for inspection period>

For one shift

8 Hr/day × 20 days/month × 12 months = approx. 1800 Hr

10 Hr/day × 20 days/month × 12 months = approx. 2400 Hr

For two shifts

15 Hr/day × 20 days/month × 12 months = approx. 3600 Hr

[Caution] When using two lines, the yearly inspection must be carried out when half the time has passed.

Fig.5-1 : Inspection schedule

## 5.2 Inspection items

The inspection items for the robot arm are shown below.

Also refer to section “5 Maintenance and Inspection” in the “Controller setup, basic operation, and maintenance” manual, and inspect the controller.

### 5.2.1 Daily inspection items

Carry out the daily inspections with the procedures given in [Table 5-1](#).

Table 5-1 : Daily inspection items (details)

Procedure	Inspection item (details)	Remedies
Before turning power ON (Check the following items before turning the power ON.)		
1	Are any of the robot installation bolts loose? (Visual)	Securely tighten the bolts.
2	Are any of the cover tightening screws loose? (Visual)	Securely tighten the screws.
3	Are any of the hand installation bolts loose? (Visual)	Securely tighten the bolts
4	Is the power supply cable securely connected? (Visual)	Securely connect.
5	Is the machine cable between the robot and controller securely connected? (Visual)	Securely connect.
6	Are there any cracks, foreign contamination or obstacles on the robot and controller cover?	Replace with a new part, or take remedial measures.
7	Is any grease leaking from the robot arm? (Visual)	After cleaning, replenish the grease.
8	Is there any abnormality in the pneumatic system? Are there any air leaks, drain clogging or hose damage? Is the air source normal? (Visual)	Drain the drainage, and remedy the air leaks (replace the part).
After turning the power ON (Turn the power ON while monitoring the robot.)		
1	Is there any abnormal motion or abnormal noise when the power is turned ON?	Follow the troubleshooting section.
During operation (try running with an original program)		
1	Check whether the movement points are deviated? Check the following points if there is any deviation. 1. Are any installation bolts loose? 2. Are any hand installation section bolts loose? 3. Are the positions of the jigs other than the robot deviated? 4. If the positional deviation cannot be corrected, refer to “Troubleshooting”, check and remedy.	Follow the troubleshooting section.
2	Is there any abnormal motion or abnormal noise? (Visual)	Follow the troubleshooting section.

### 5.2.2 Periodic inspection

Carry out periodic inspection with the procedures given in [Table 5-2](#).

Table 5-2 : Periodic inspection items (details)

Procedure	Inspection item (details)	Remedies
Monthly inspection items		
1	Are any of the bolts or screws on the robot arm loose?	Securely tighten the bolts.
2	Are any of the connector fixing screws or terminal block terminal screws loose?	Securely tighten the screws.
3	Remove the cover at each section, and check the cables for wear damage and adherence of foreign matter.	Check and eliminate the cause. If the cables are severely damaged, contact the Mitsubishi Service Department.
Yearly inspection items		
1	Lubricate the grease at the harmonic reduction gears for each axis.	Lubricate it referring to <a href="#">Page 70, "5.3.2 Lubrication"</a> .
2	Replace the backup battery in the robot arm.	Exchange it referring to <a href="#">Page 82, "5.3.3 Replacing the backup battery"</a> .

### 5.3 Maintenance and inspection procedures

The procedures for carrying out the periodic maintenance and inspection are described in this section. Thoroughly read the contents, and follow the instructions. This work can be commissioned to the Mitsubishi Service Department for a fee. (Never disassemble, etc., the parts not described in this manual.)

The maintenance parts, etc., required for the user to carry out maintenance and inspection are described in section Page 84, "5.4 Maintenance parts" of this manual. Always contact your dealer when parts are needed.

**⚠ CAUTION** The origin of the machine system could deviate when this work is carried out. "Review of the position data" and "re-teaching" will be required.

#### 5.3.1 Robot arm structure

##### (1) J3 axis (vertical axis) drive mechanism

The J3 axis has a function to move the entire horizontal arm up and down and to hold at the stopped state.

##### ■ RH-1000GHDC-SA/GJDC-SA

The rotation of the AC servomotor rotates the ball screw 2 screw and ball screw 1 nut via the spur gears. With the rotation of the ball screw 1 nut, the middle of the Z axis casing moves up and down in respect to the body base. In the same manner, the top of the Z axis casing moves up and down in respect to the middle of the Z axis casing with the rotation of the ball screw 2 screw.

<RH-1000GHDC-SA/GJDC-SA>

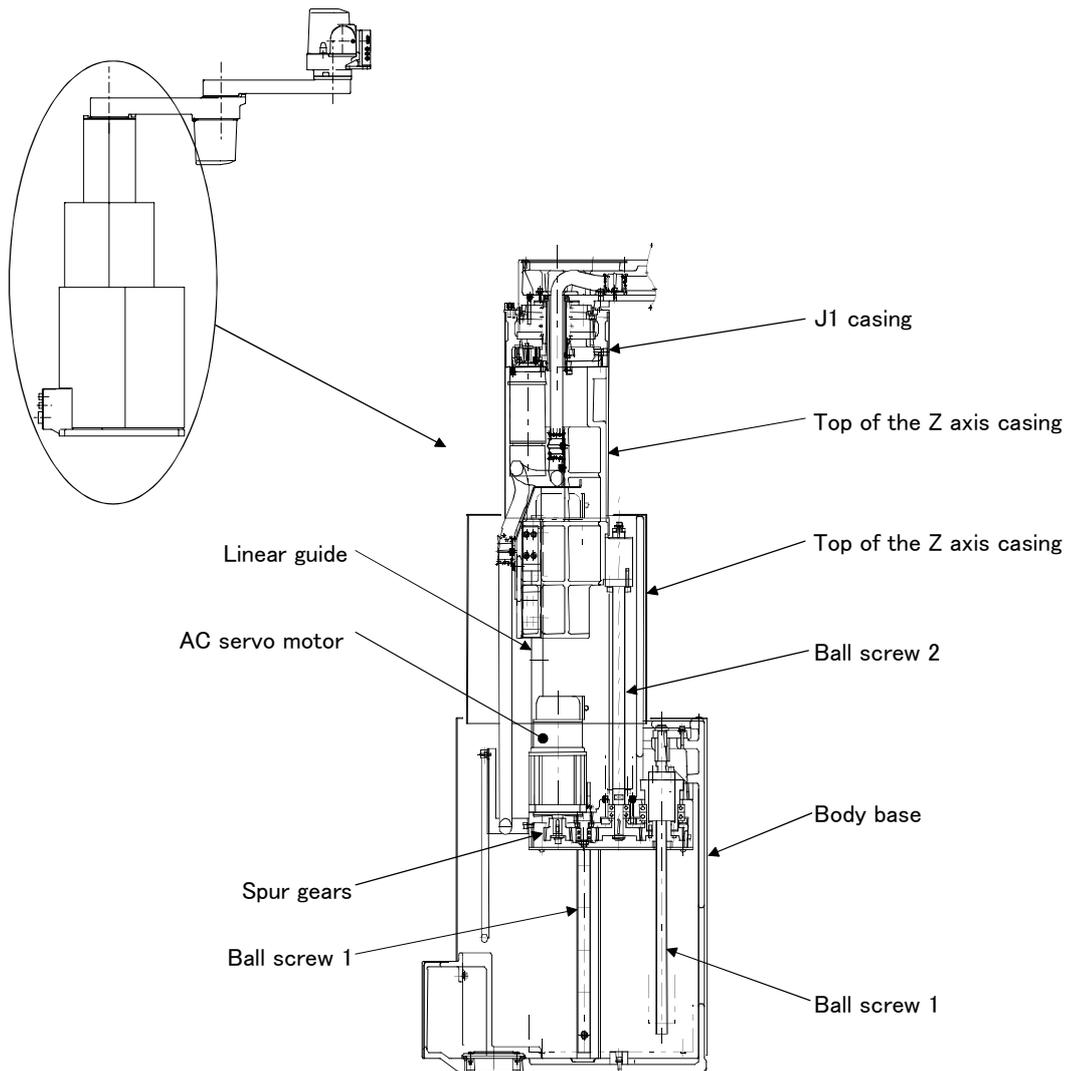


Fig.5-2 : J3 axis (vertical axis) drive mechanism (RH-1000GHDC-SA/GJDC-SA)

■ RH-1000GHLC-SA/GJLC-SA, RH-1500G series

The rotation of the AC servomotor is conveyed to reduction gears 1 to rotate the lower arm. At the same time, the AC servomotor rotation is conveyed to reduction gears 2 and reduction gears 3 via the shaft and spiral bevel gears to rotate the upper arm and J1 base.

<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>

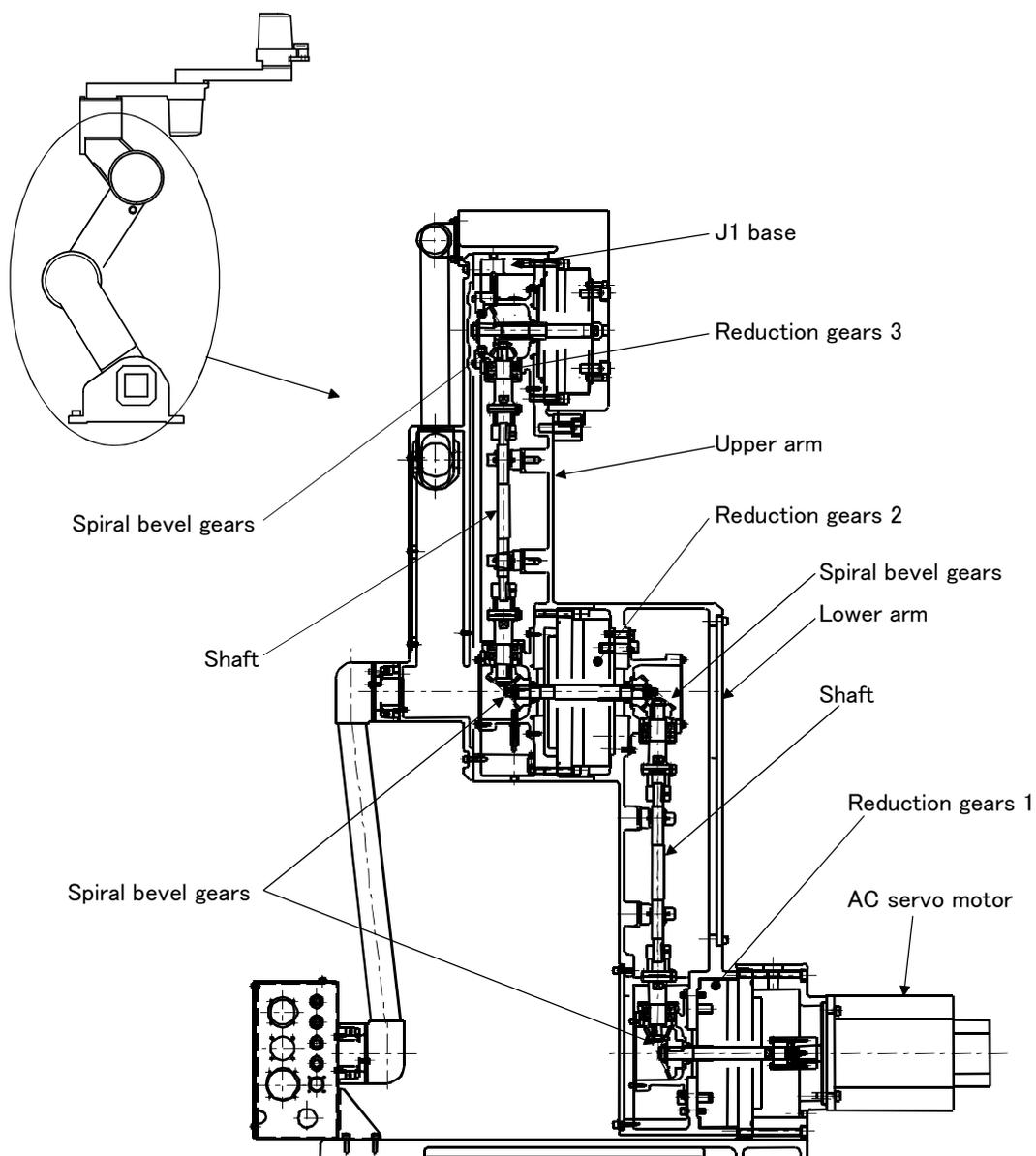


Fig.5-3 : J3 axis (vertical axis) drive mechanism (RH-1000GHLC-SA/GJLC-SA, RH-1500G series)

(2) J1 axis drive mechanism

The J1 axis has a function to swing the entire arm.

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to swing the No. 1 arm.

■ RH-1000GHDC-SA/GJDC-SA

<RH-1000GHDC-SA/GJDC-SA>

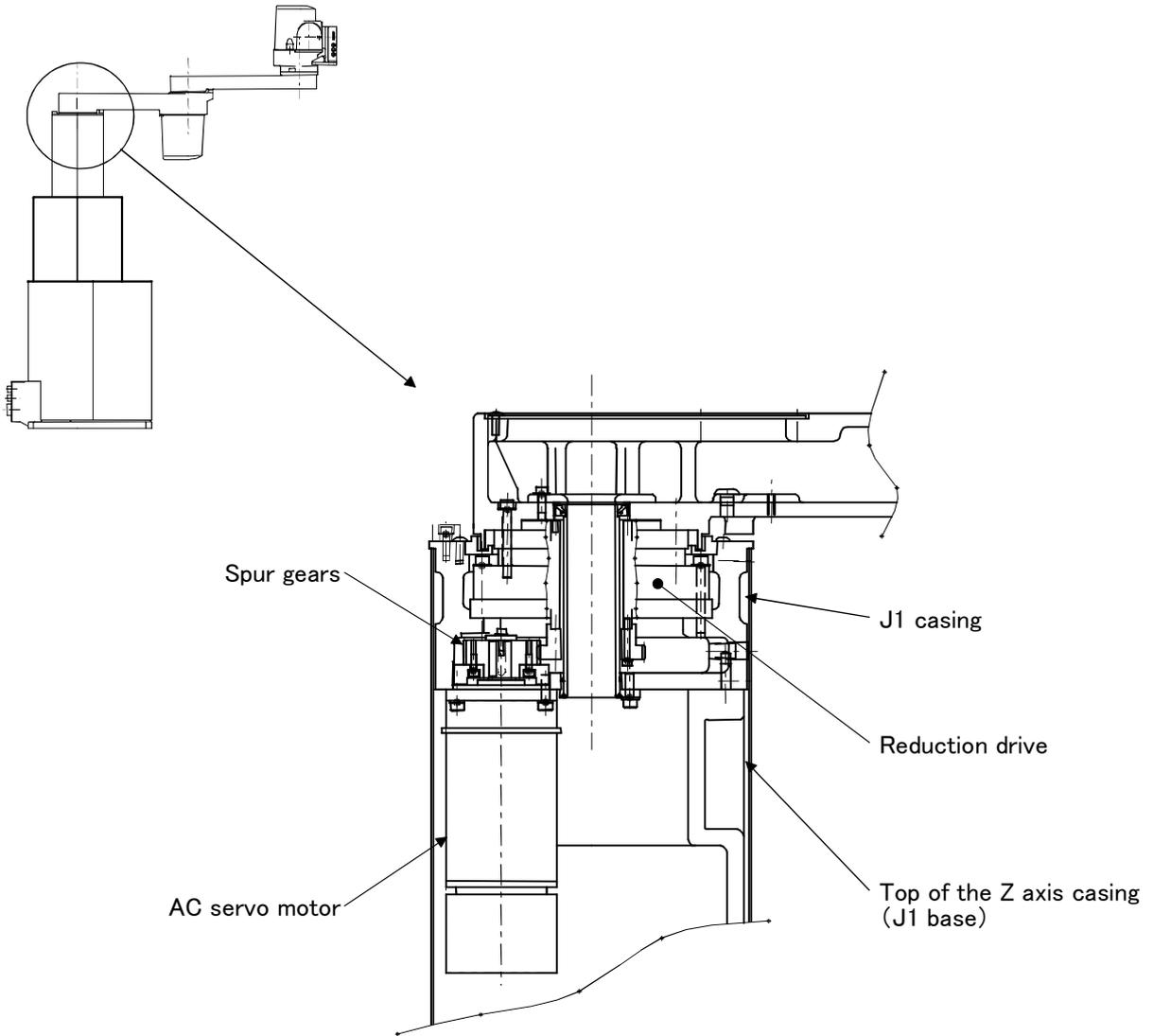


Fig.5-4 : J1 axis drive mechanism (RH-1000GHDC-SA/GJDC-SA)

## ■ RH-1000GHLC-SA/GJLC-SA

&lt;RH-1000GHLC-SA/GJLC-SA&gt;

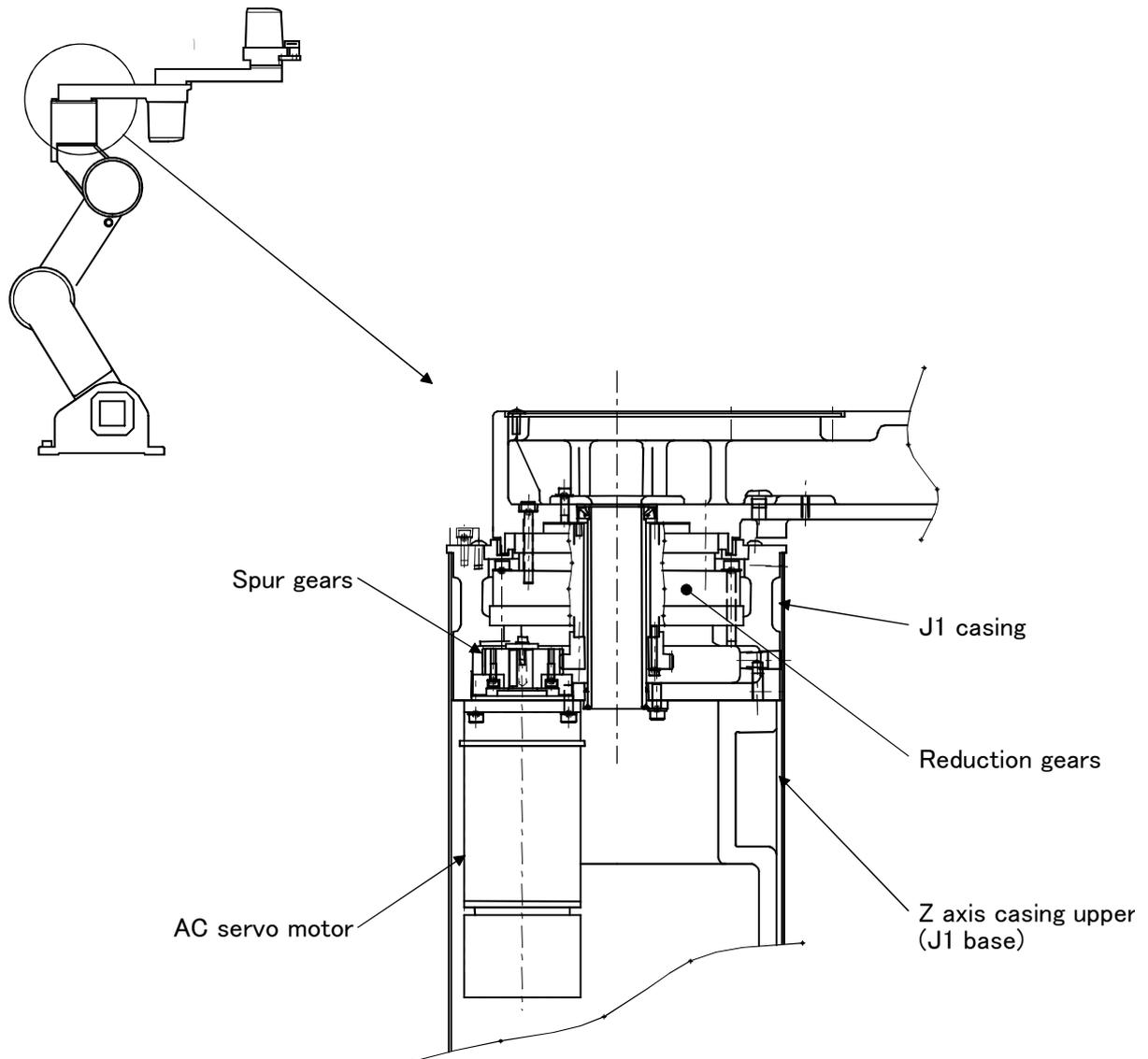


Fig.5-5 : J1 axis drive mechanism (RH-1000GHLC-SA/GJLC-SA)

■ RH-1500G series

<RH-1500G series>

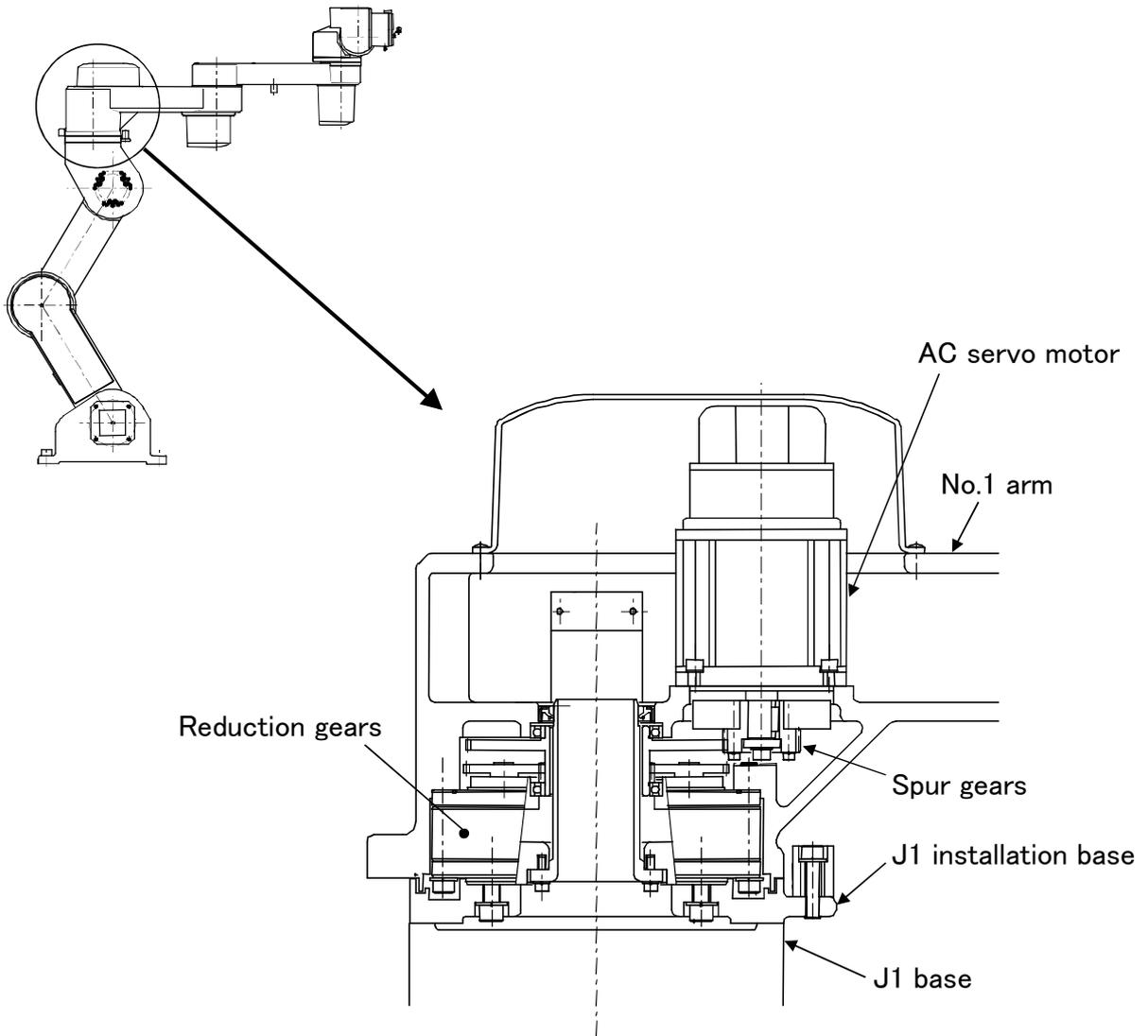


Fig.5-6 : J1 axis drive mechanism (RH-1500G series)

### (3) J2 axis drive mechanism

The J2 axis has a function to swing the whole of the No.2 arm.

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to swing the No. 2 arm.

#### ■ RH-1000GHDC-SA/GJDC-SA

<RH-1000GHDC-SA/GJDC-SA>

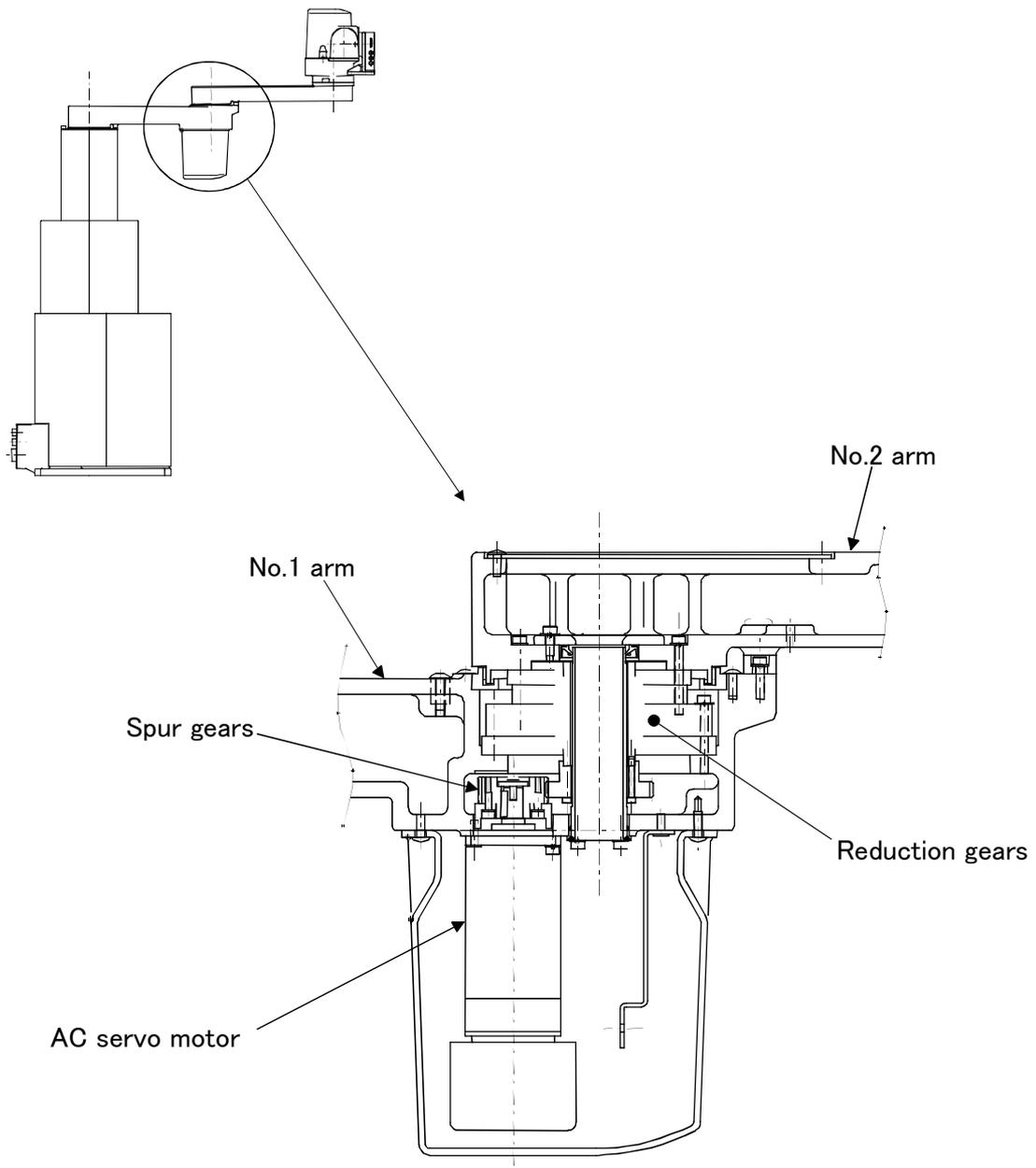


Fig.5-7 : J2 axis drive mechanism (RH-1000GHDC-SA/GJDC-SA)

■ RH-1000GHLC-SA/GJLC-SA, RH-1500G series

<RH-1000GHLC-SA/GJLC-SA, RH-1500G series>

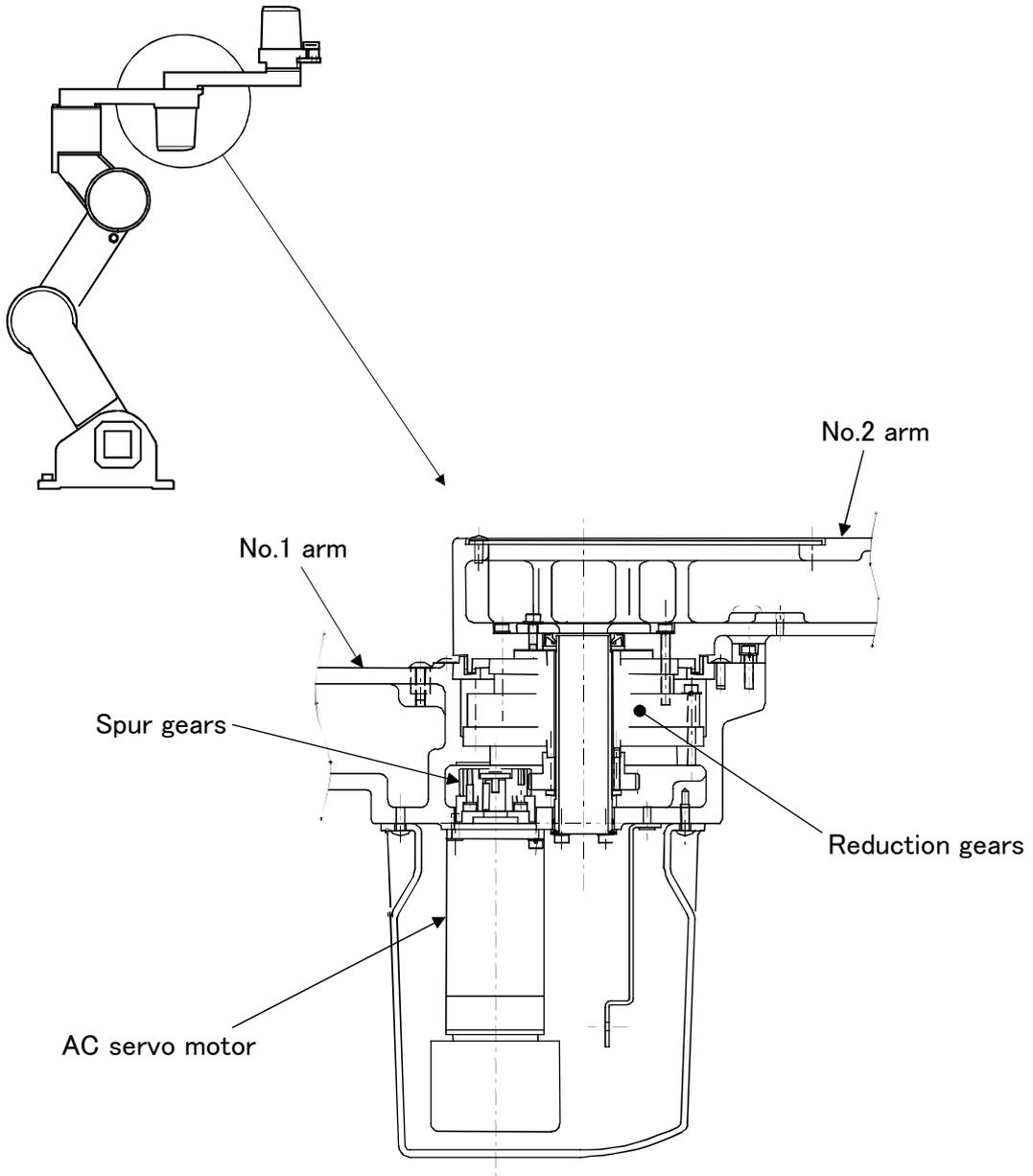


Fig.5-8 : J2 axis drive mechanism (RH-1000GHLC-SA/GJLC-SA, RH-1500 series)

#### (4) J4 axis drive mechanism

The J4 axis has a function to swing the wrist section (J5 axis or J5, J6 axis) and hand.

#### ■ RH-1000GHDC-SA/GJDC-SA

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to swing the J4 casing.

<RH-1000GHDC-SA/GJDC-SA>

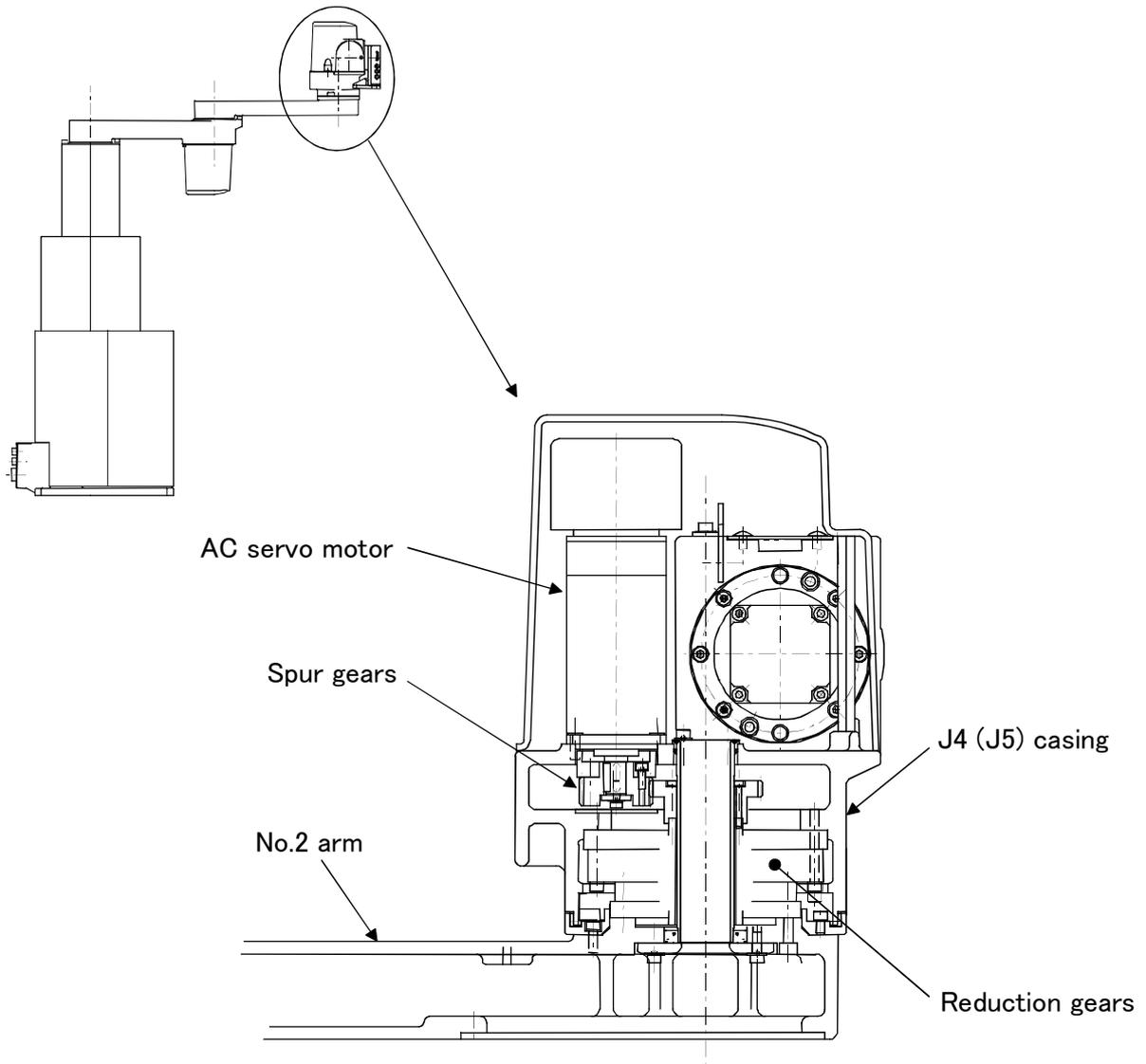


Fig.5-9 : J4 axis drive mechanism (RH-1000GHDC-SA/GJDC-SA)

■ RH-1000GHLC-SA/GJLC-SA

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to swing the J4 casing.

<RH-1000GHLC-SA/GJLC-SA>

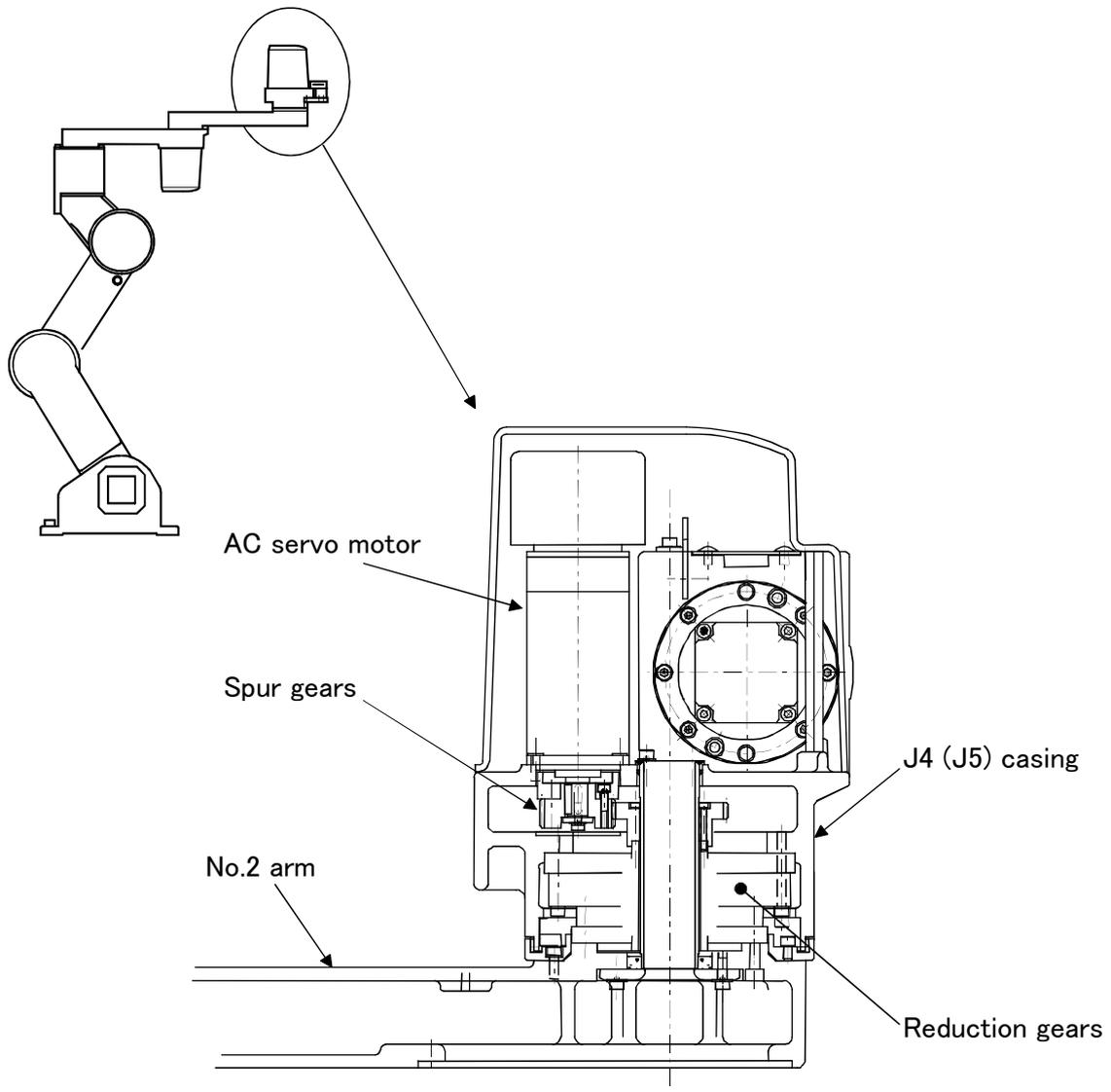


Fig.5-10 : J4 axis drive mechanism (RH-1000GHLC-SA/GJLC-SA)

## ■ RH-1500G series

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to swing the J5 casing.

<RH-1500G series>

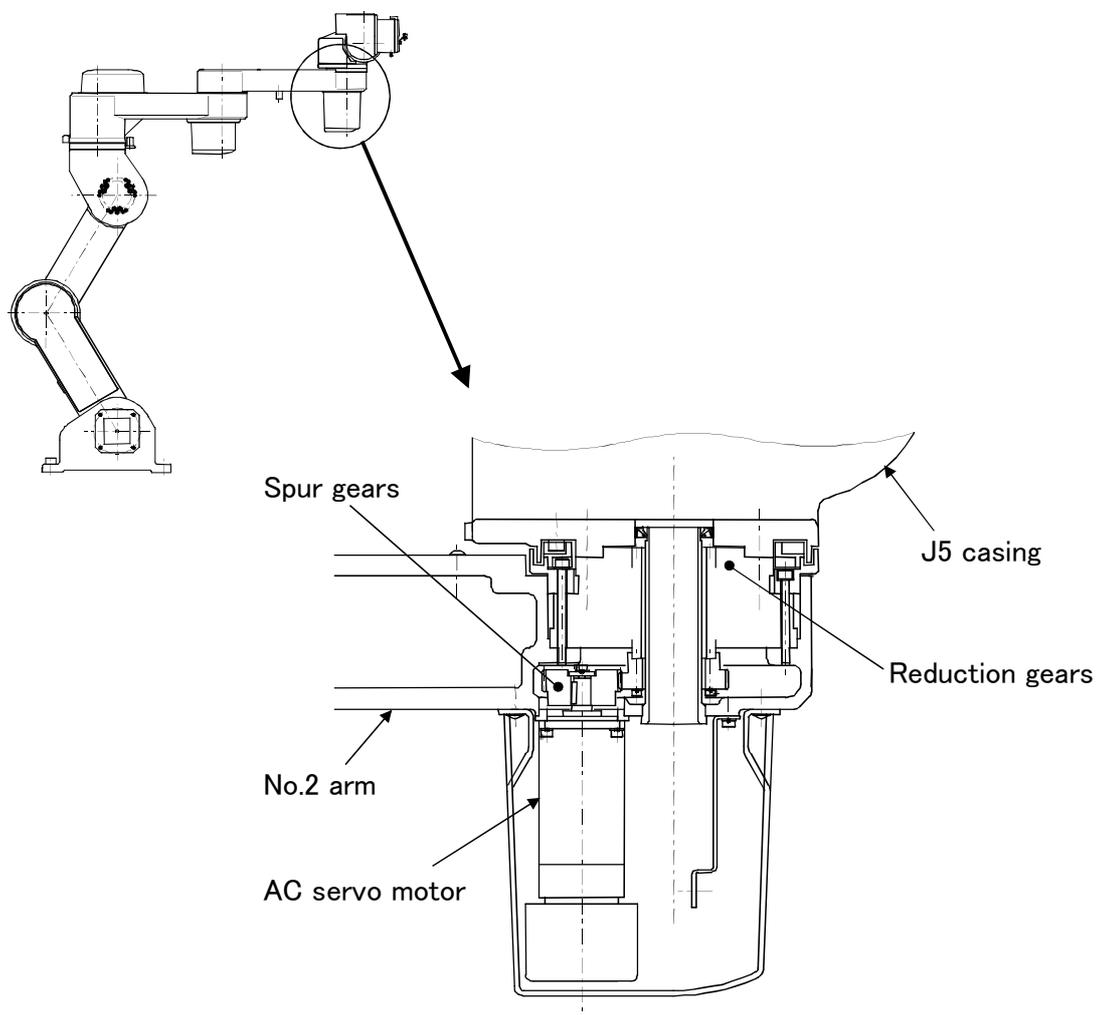


Fig.5-11 : J4 axis drive mechanism (RH-1500G series)

(5) J5 axis drive mechanism

The J5 axis has a function to rotate the J5 flange and hand.

■ RH-1000GJDC-SA(5-axis type)

The rotation of the AC servomotor is directly conveyed to the reduction gears to swing the J5 casing.

<RH-1000GJDC-SA>

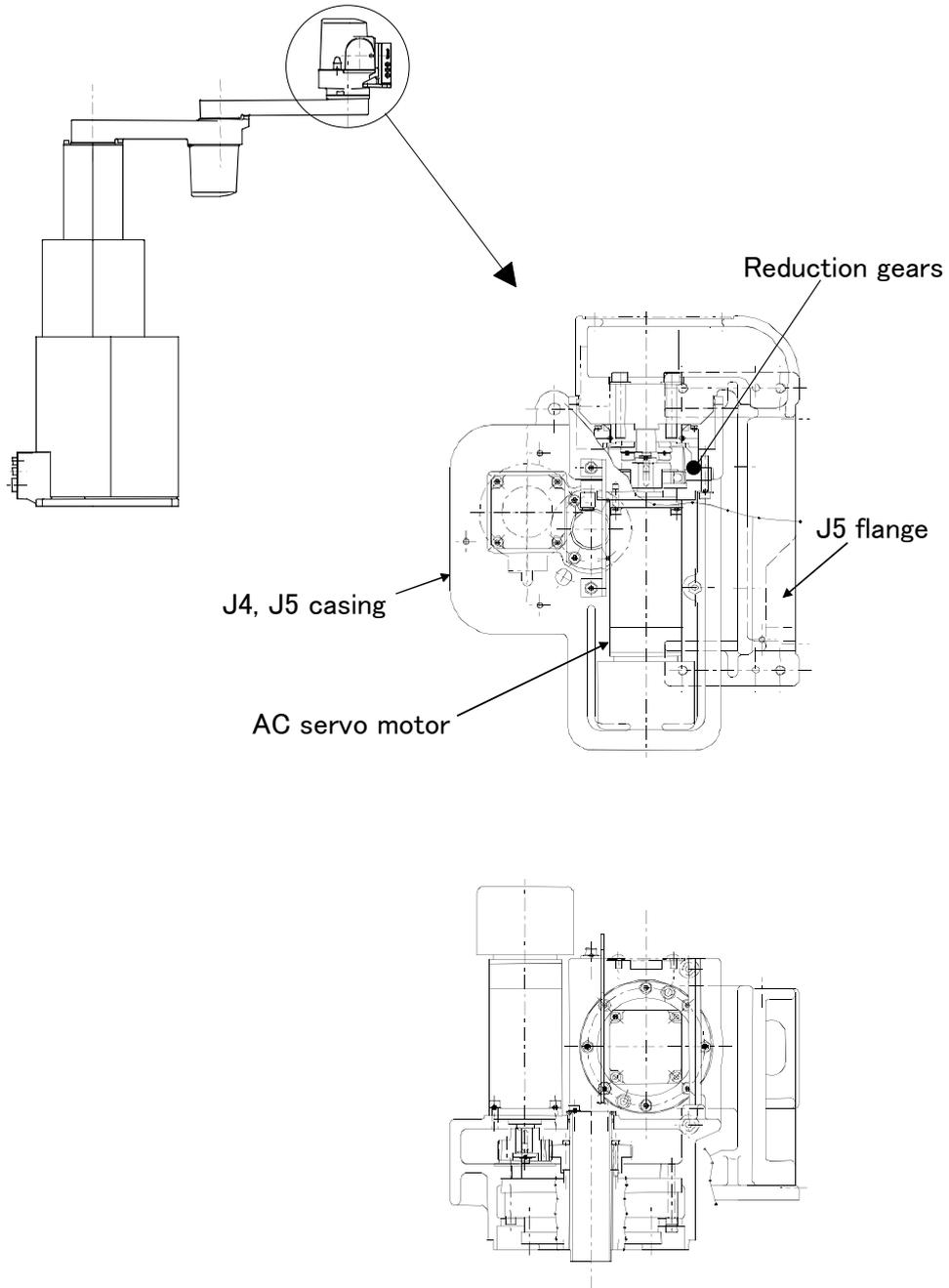


Fig.5-12 : J5 axis drive mechanism(RH-1000GJDC-SA)

## ■ RH-1000GJLC-SA (5-axis type)

The rotation of the AC servomotor is directly conveyed to the reduction gears to turn the J5 flange.

<RH-1000GJLC-SA>

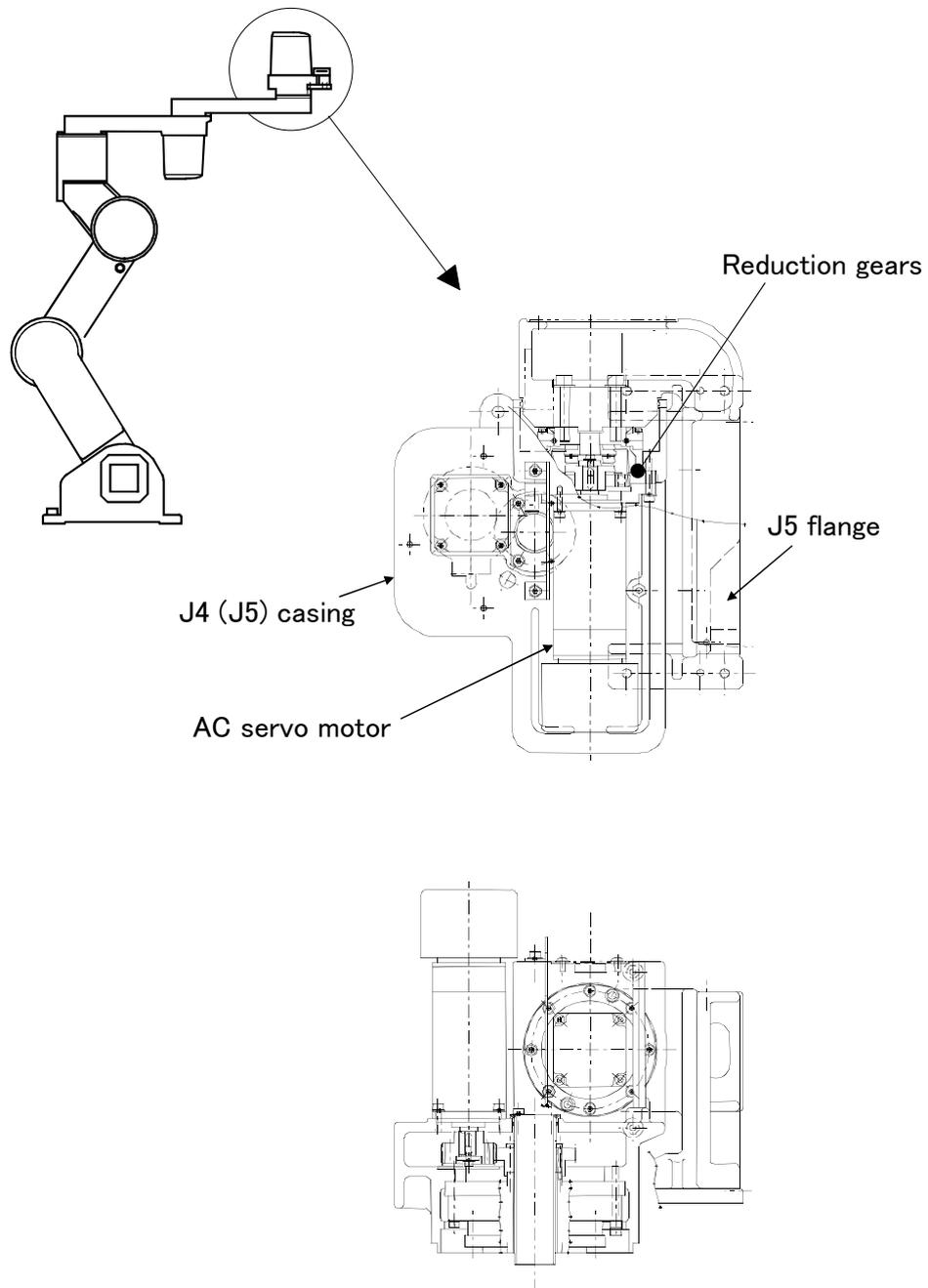


Fig.5-13 : J5 axis drive mechanism (RH-1000GJLC-SA)

■ RH-1500G series

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to rotate the wrist flange (5-axis type) or the J6 axis (6-axis type).

<RH-1500G series>

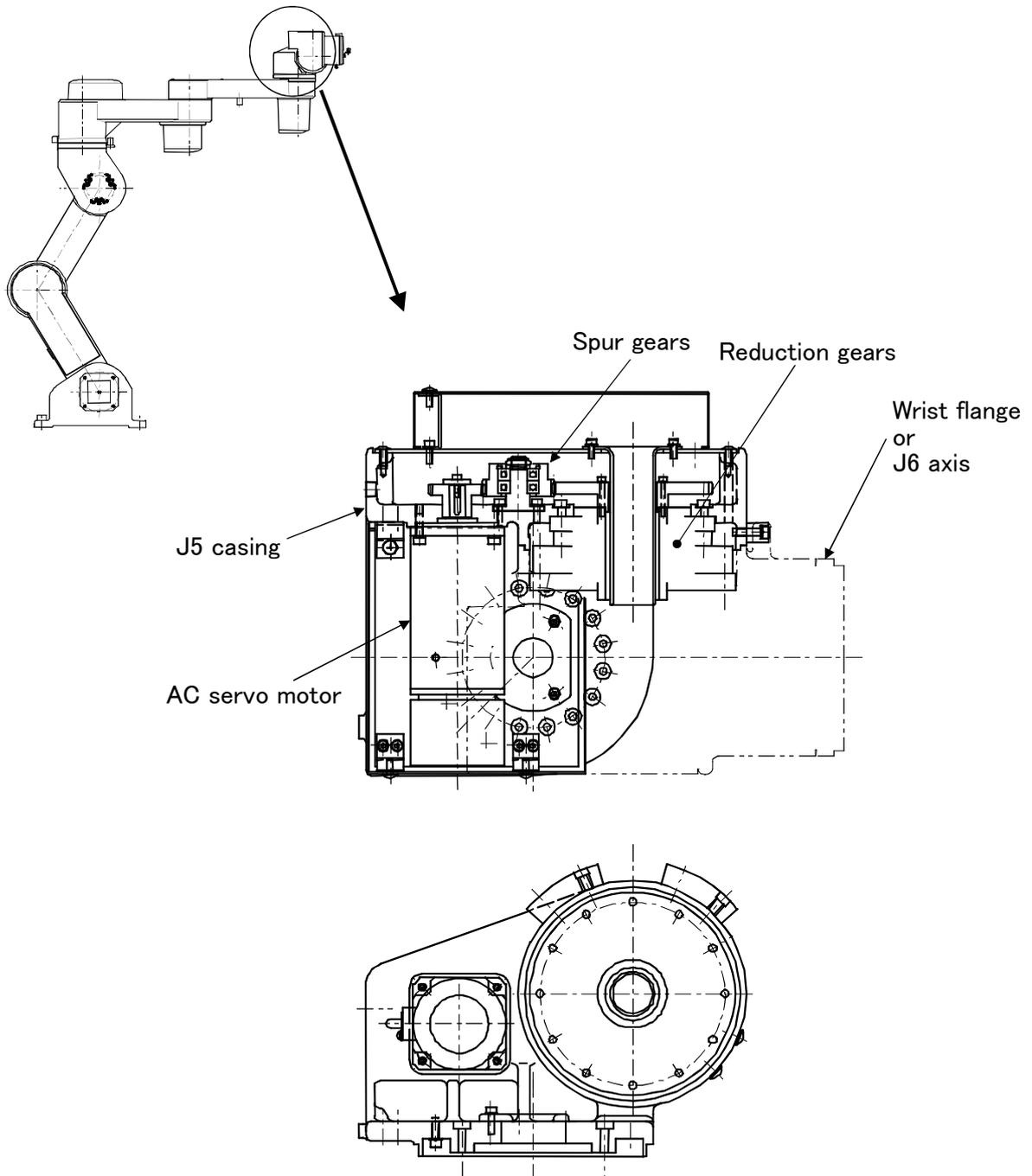


Fig.5-14 : J5 axis drive mechanism (RH-1500G series)

## (6) J6 axis drive mechanism (Only RH-1500G series 6-axis type.)

The J6 axis has a function to rotate the wrist flange and hand.

The rotation of the AC servomotor is conveyed to the reduction gears via the spur gears to rotate the wrist flange.

<RH-1500G series>

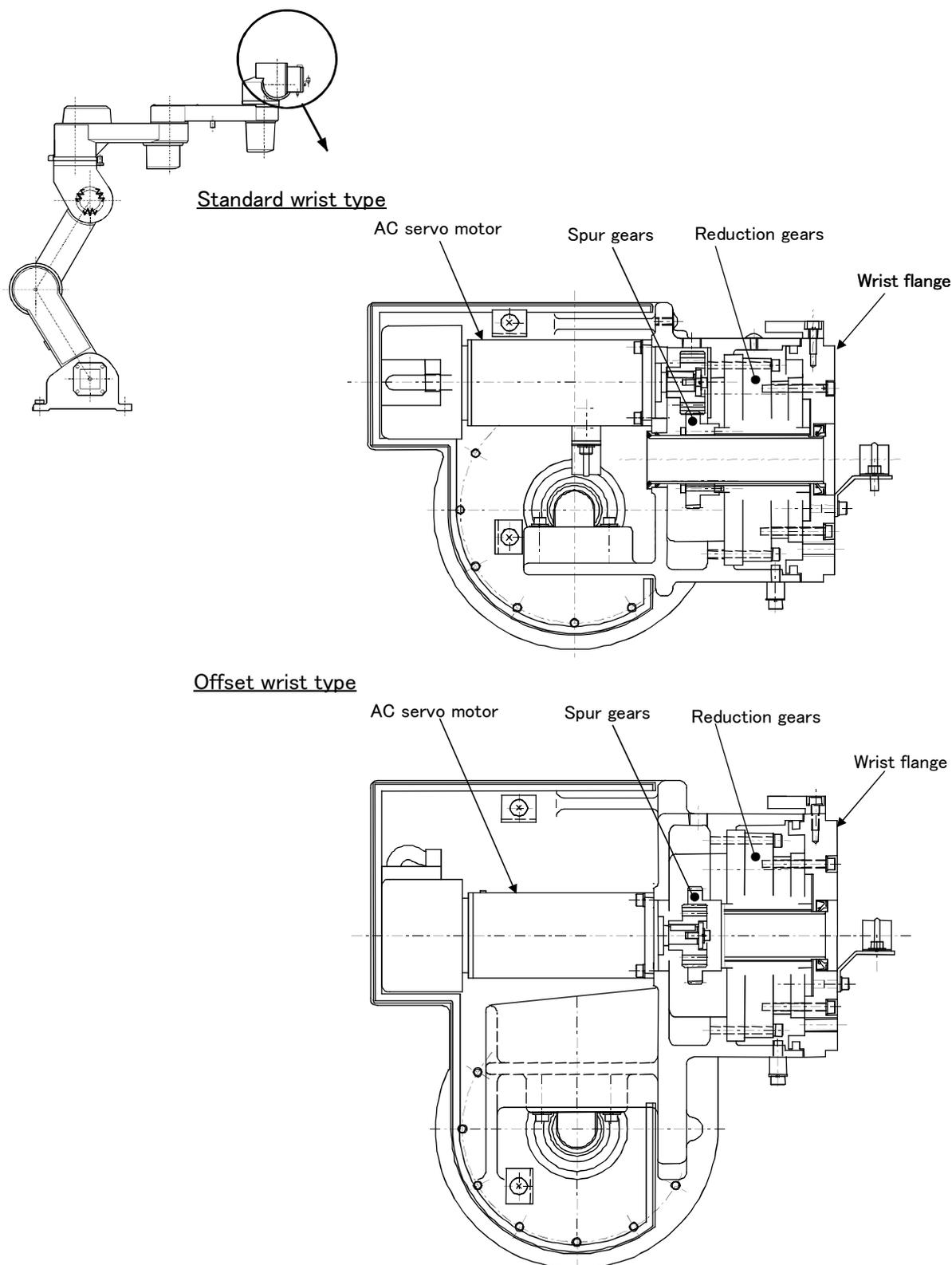


Fig.5-15 : J6 axis drive mechanism (RH-1500G series)

5.3.2 Lubrication

(1) Lubrication positions and lubrication amount

The lubrication positions are shown in Fig. 5-16, and the lubrication positions and lubrication amounts are shown in Table 5-3. The method for lubricating each axis is explained in the following section.

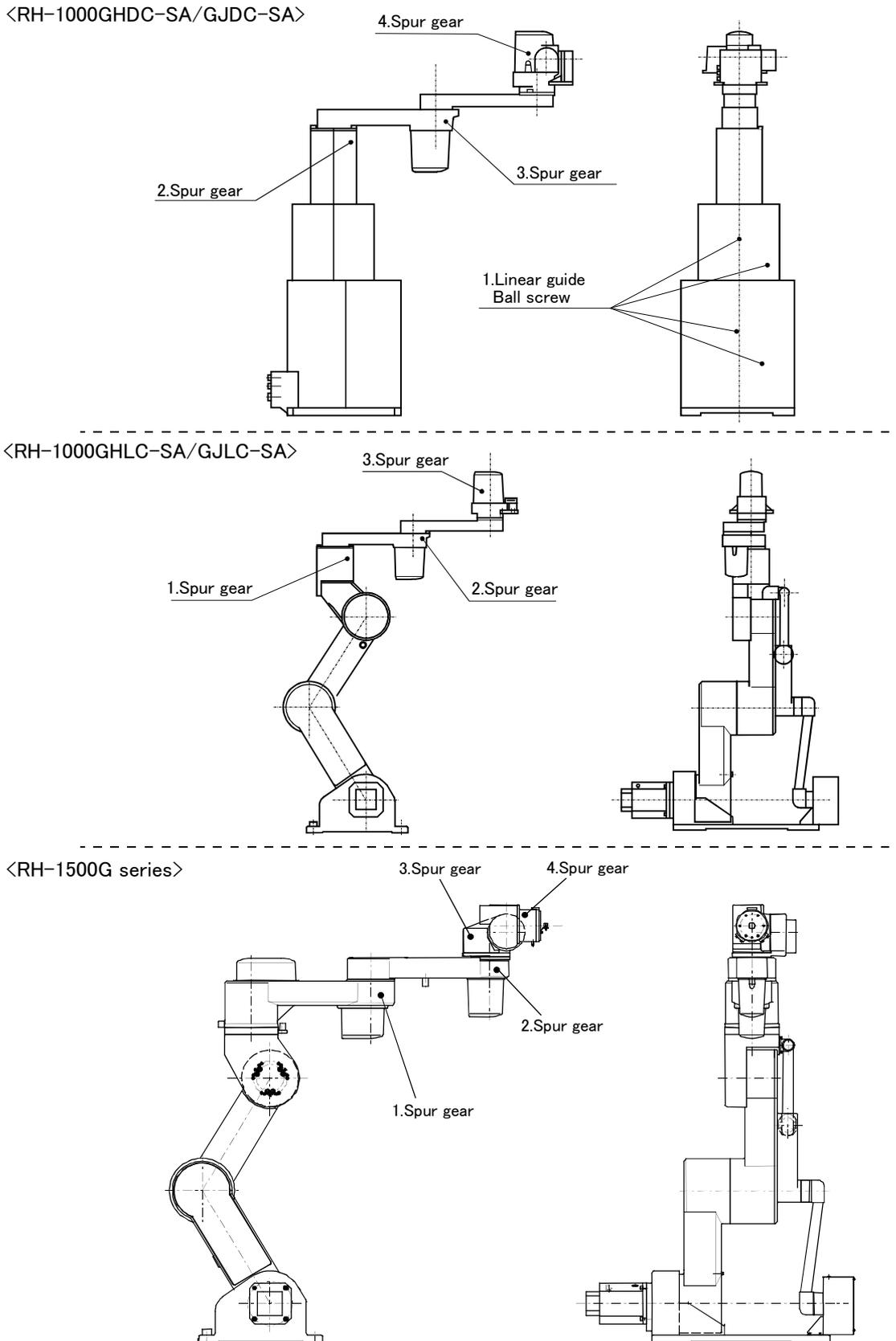


Fig.5-16 : Lubrication positions

Table 5-3 : Lubrication positions and lubrication amounts

No.	Replenishment position		Grease		Lubrication interval (time)
	Axis	Target part	Type	Amount	
Model : RH-1000GHDC-SA/GJDC-SA					
1	J3 axis	Linear guide Ball screw	AFE Grease	40g X 2 positions 10g X 2 positions	1500Hr
2	J1 axis	Spur gear	Multipurpose No. 2 (N)	10g	6000Hr
3	J2 axis			10g	
4	J4 axis			10g	
Model : RH-1000GHLC-SA/GJLC-SA					
1	J1 axis	Spur gear	Multipurpose No. 2 (N)	10g	6000Hr
2	J2 axis			10g	
3	J4 axis			10g	
Model : RH-1500G series					
1	J2 axis	Spur gear	Multipurpose No. 2 (N)	10g	6000Hr
2	J4 axis			10g	
3	J5 axis			10g	
4	J6 axis			10g	

**CAUTION**

Follow the values given in [Table 5-3](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking, and must be avoided.

Avoid lubricating the grease during the daily inspections.

(2) J3 axis grease replenishment method(Only RH-1000GHDC-SA/GJDC-SA type.)

- 1) Rise to the state shown in Fig. 5-17, and remove the body cover and Z axis cover (middle).
- 2) Apply grease with finger on the ball transfer surface of linear guide.
- 3) On the ball screw, apply a light coat of grease with a finger so that the grease does not scatter on the ball transfer surface.
- 4) Install the body cover and Z axis cover (middle).

**CAUTION**

Follow the values given in Page 71, "Table 5-3" for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 1500 hours that the motor power is ON.

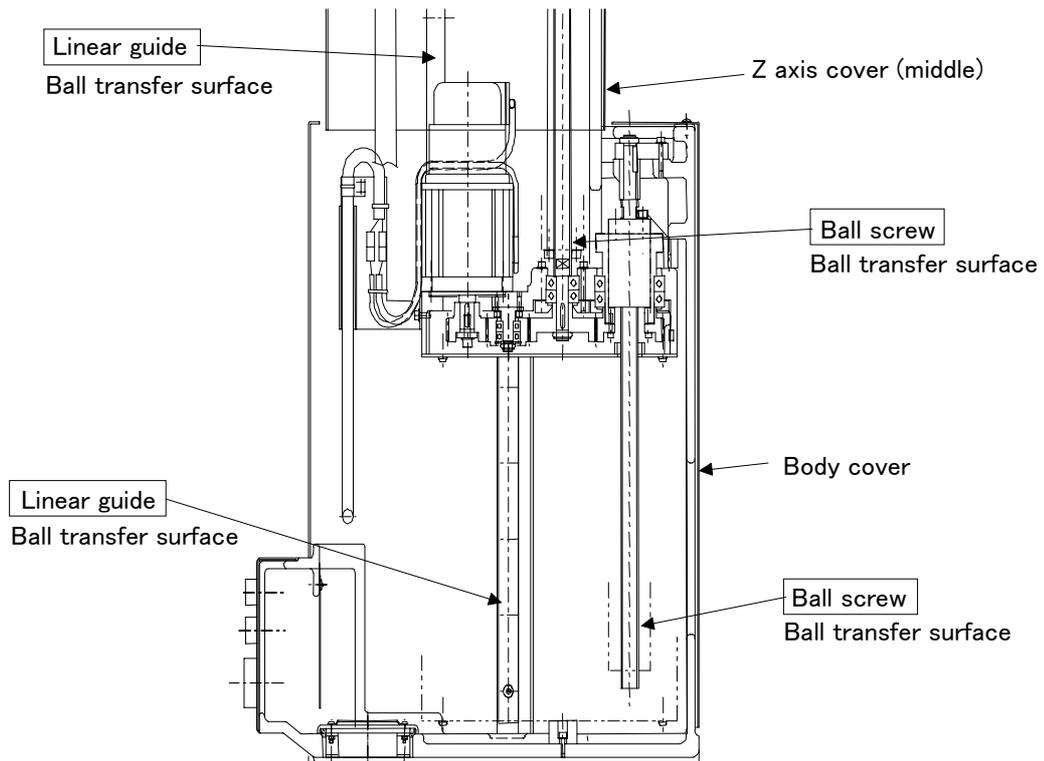


Fig.5-17 : J3 axis grease replenishment(RH-1000GHDC-SA/GJDC-SA)

## (3) J1 axis grease replenishment method(Only RH-1000G series.)

- 1) Remove the Z axis cover (top), and remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm). After releasing only the brakes for the J1 axis, press the arm section by hand, and apply grease on the entire teeth circumference while rotating the gears.  
Refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations" for the brake release method.
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.

**CAUTION**

Follow the values given in [Page 71](#), "Table 5-3" for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1000GHDC-SA/GJDC-SA/GHLC-SA/GJLC-SA>

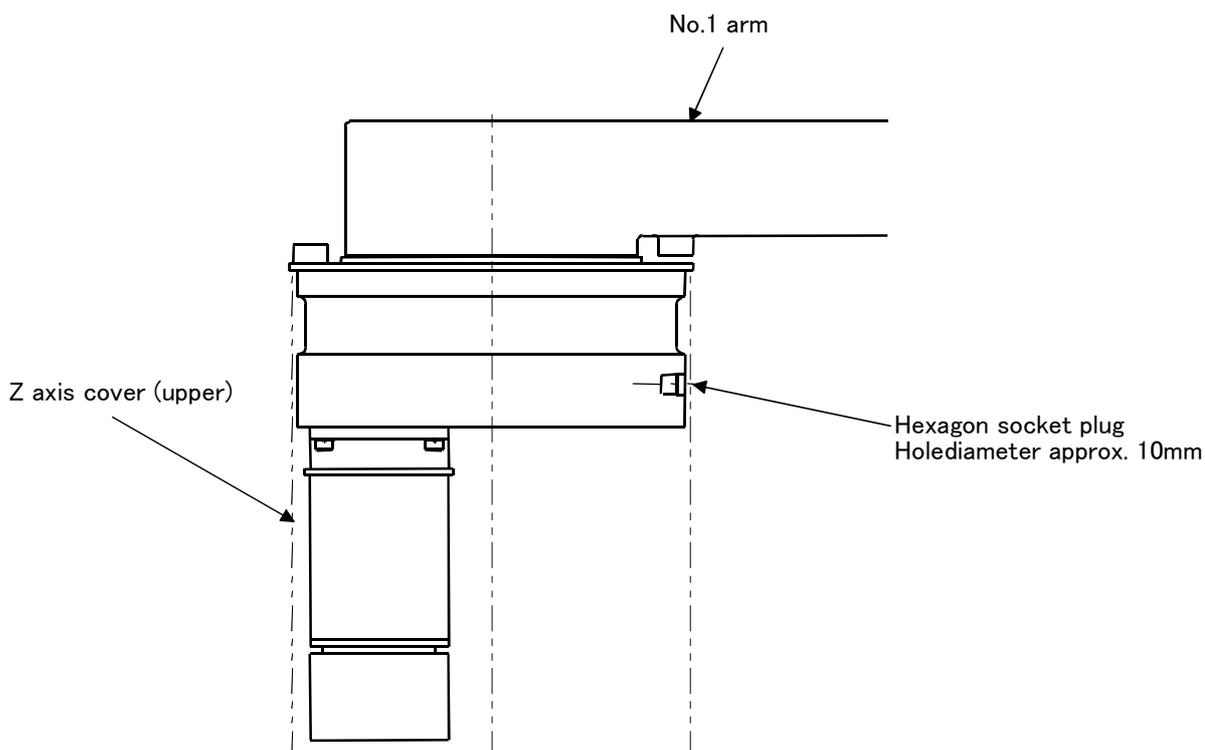


Fig.5-18 : J1 axis grease replenishment (RH-1000GHDC-SA/GJDC-SA/GHLC-SA/GJLC-SA)

(4) J2 axis grease replenishment methods

■ RH-1000GHDC-SA/GJDC-SA

- 1) Remove the motor cover, and remove the hexagon socket plug. This plug faces downward, so take care to grease dripping.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm). After releasing only the brakes for the J2 axis, press the arm section by hand, and apply grease on the entire teeth circumference while rotating the gears.  
Refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations" for the brake release method.
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.

**CAUTION**

Follow the values given in Page 71, "Table 5-3" for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

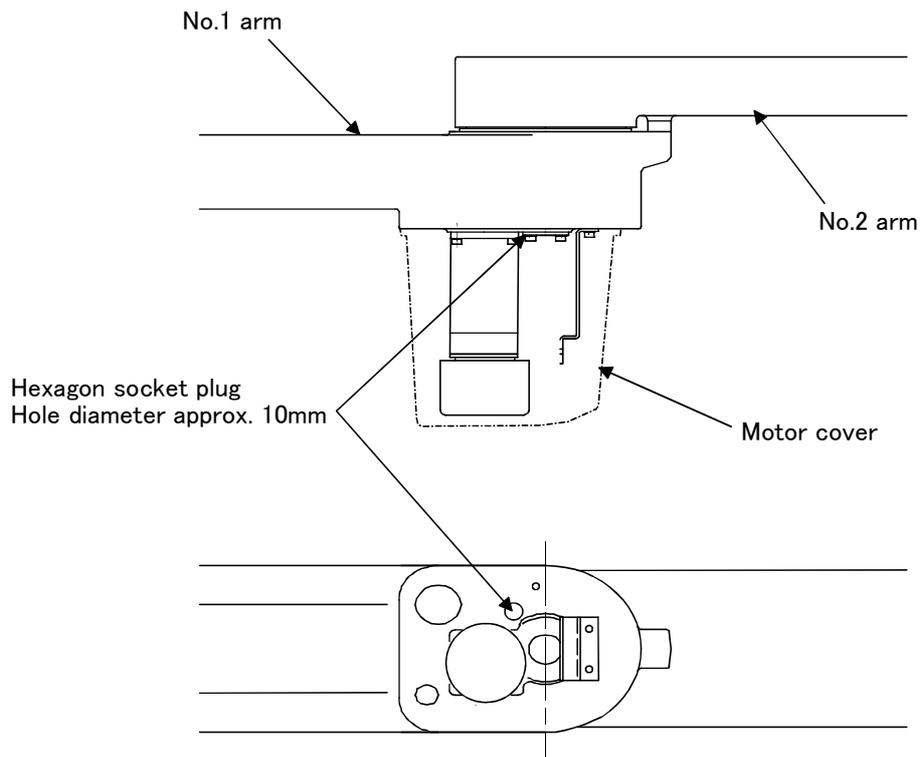


Fig.5-19 : J2 axis grease replenishment (RH-1000GHDC-SA/GJDC-SA)

■ RH-1000GHLC-SA/GJLC-SA

- 1) Remove the motor cover, and remove the hexagon socket plug. This plug faces downward, so take care to grease dripping.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm). After releasing only the brakes for the J2 axis, press the arm section by hand, and apply grease on the entire teeth circumference while rotating the gears.  
Refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations" for the brake release method.
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.



## CAUTION

Follow the values given in [Page 71, "Table 5-3"](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1000GHLC-SA/GJLC-SA>

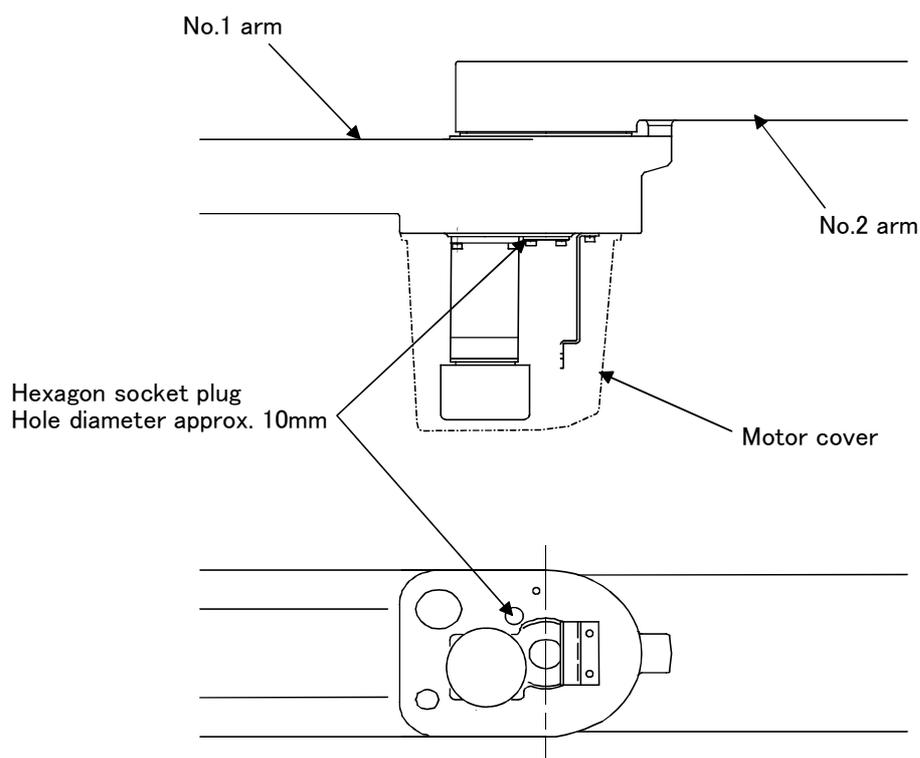


Fig.5-20 : J2 axis grease replenishment(RH-1000GHLC-SA/GJLC-SA)

■ RH-1500G series

- 1) Remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm).
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.



**CAUTION**

Follow the values given in [Page 71, "Table 5-3"](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1500G series>

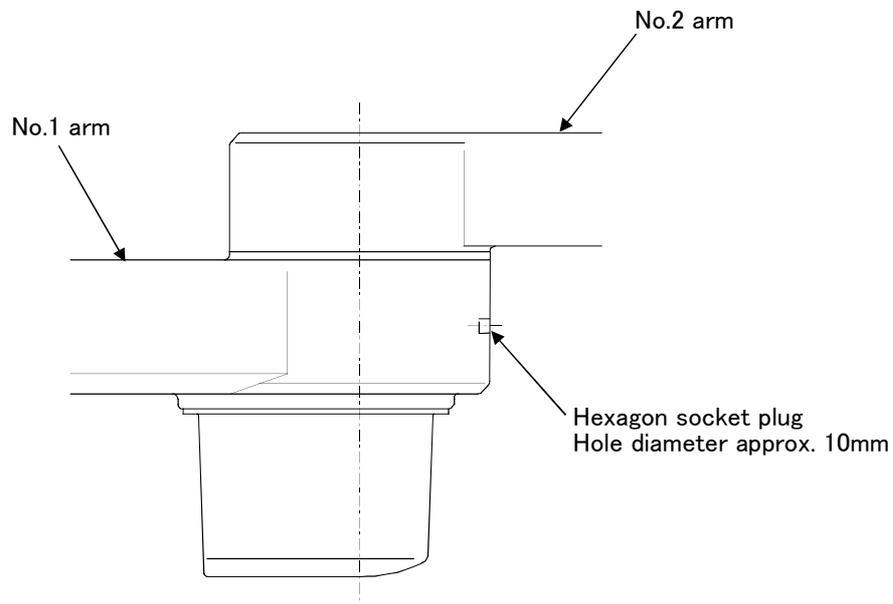


Fig.5-21 : J2 axis grease replenishment (RH-1500G series)

## (5) J4 axis grease replenishment method

## ■ RH-1000GHDC-SA(4-axis type)、RH-1000GHLC-SA(4-axis type)

- 1) Remove the motor cover, and remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm). After releasing only the brakes for the J4 axis, press the arm section by hand, and apply grease on the entire teeth circumference while rotating the gears.  
Refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations" for the brake release method.
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.

**CAUTION**

Follow the values given in [Page 71](#), "Table 5-3" for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1000GHDC-SA/GHLC-SA>

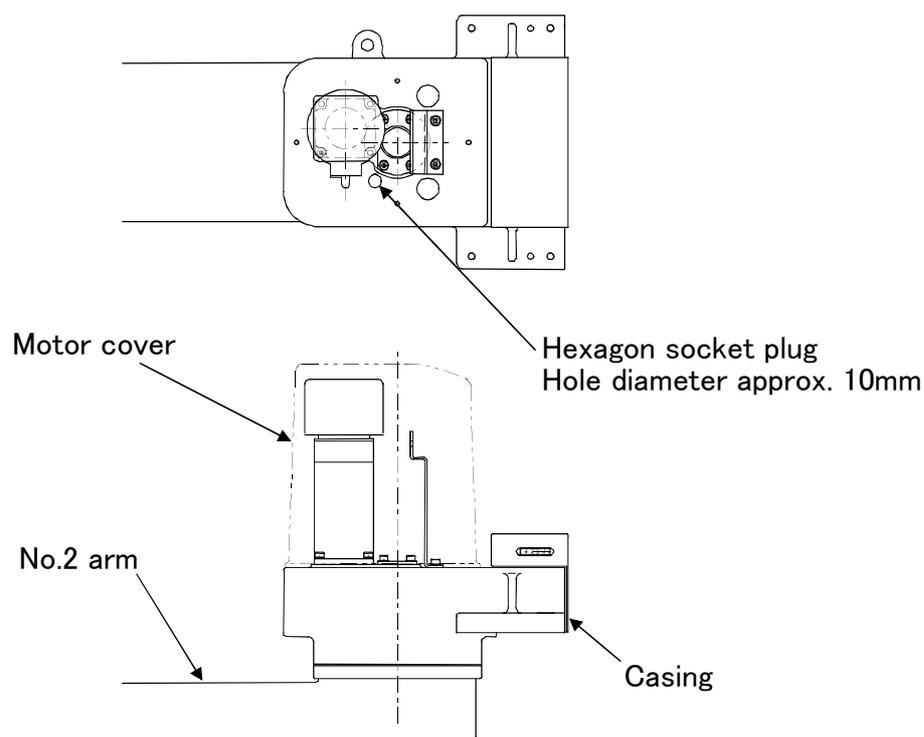


Fig.5-22 : J4 axis grease replenishment (RH-1000GHDC-SA/RH-1000GHLC-SA)

■ RH-1000GJDC-SA(5-axis type)、RH-1000GJLC-SA(5-axis type)

- 1) Remove the J5 motor cover, and remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm). After releasing only the brakes for the J4 axis, press the arm section by hand, and apply grease on the entire teeth circumference while rotating the gears.  
Refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations" for the brake release method.
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.



**CAUTION**

Follow the values given in [Page 71, "Table 5-3"](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1000GJDC-SA/GJLC-SA>

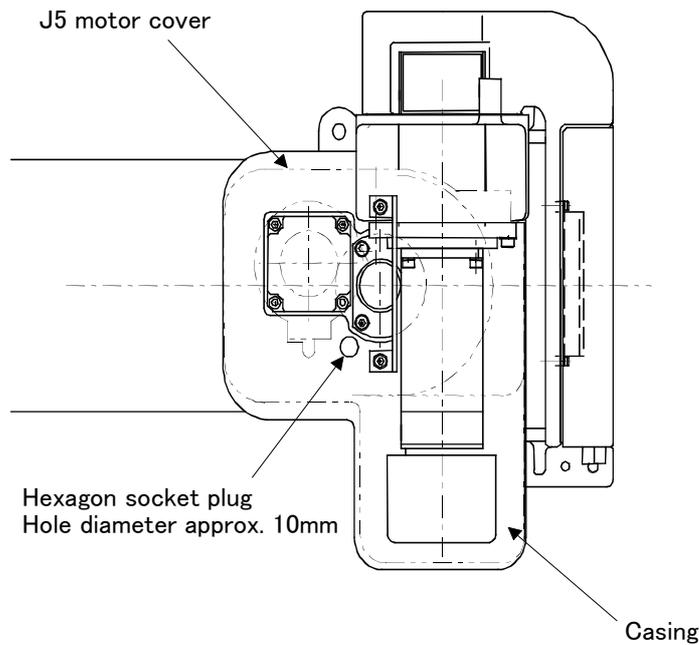


Fig.5-23 : J4 axis grease replenishment (RH-1000GJDC-SA/RH-1000GJLC-SA)

## ■ RH-1500G series

- 1) Remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm).
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.

**CAUTION**

Follow the values given in [Page 71, "Table 5-3"](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1500G series>

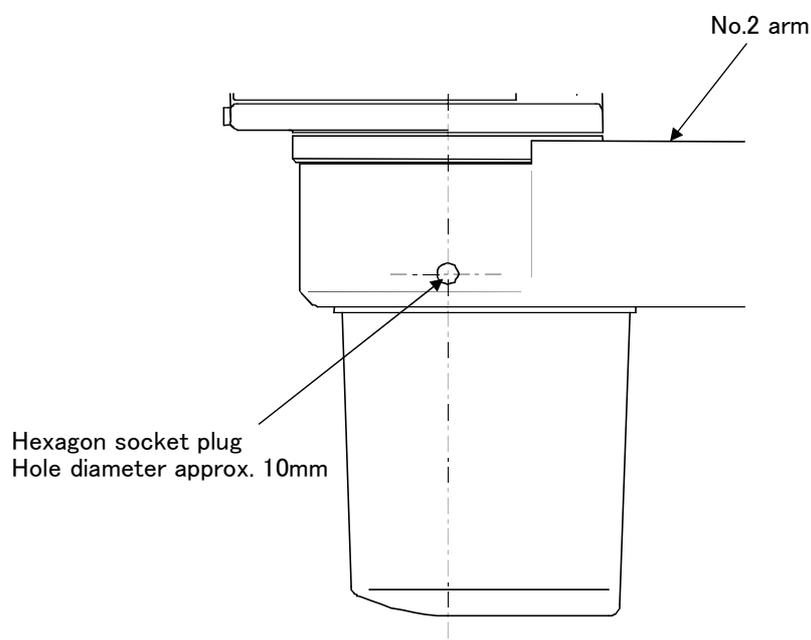


Fig.5-24 : J4 axis grease replenishment (RH-1500G series)

(6) J5 axis grease replenishment methods (RH-1500G series)

- 1) Remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm).
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.



**CAUTION**

Follow the values given in [Page 71, "Table 5-3"](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1500G series>

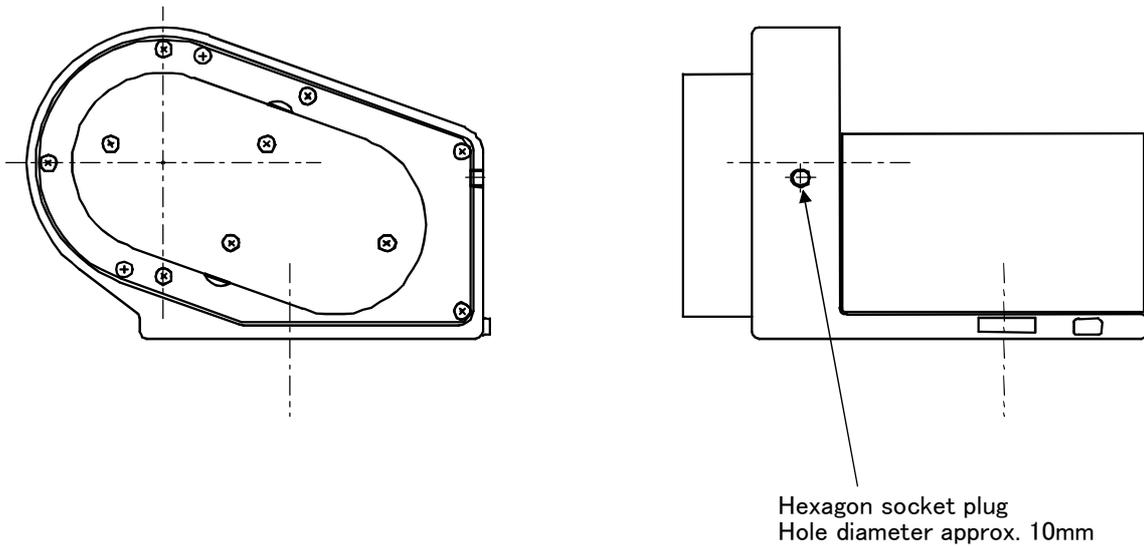


Fig.5-25 : J5 axis grease replenishment (RH-1500G series)

## (7) J6 axis grease replenishment methods(Only RH-1500G series 6-axis type.)

- 1) Remove the hexagon socket plug.
- 2) Apply new grease on the spur gears from the hole (hole diameter approx. 10mm).
- 3) Wind sealing tape on the hexagon socket plug. (Wind two to three wraps around the area one-half from the end so that the sealing tape does not protrude outward after installing.)
- 4) Install the hexagon socket plug.

**CAUTION**

Follow the values given in [Page 71, "Table 5-3"](#) for the lubrication amounts. Excessive lubrication will lead to grease leaking and scattering. Replenish the grease after every 6000 hours that the motor power is ON. The grease can be replenished up to five times. Avoid lubricating the grease during the daily inspections.

<RH-1500G series 6-axis type>

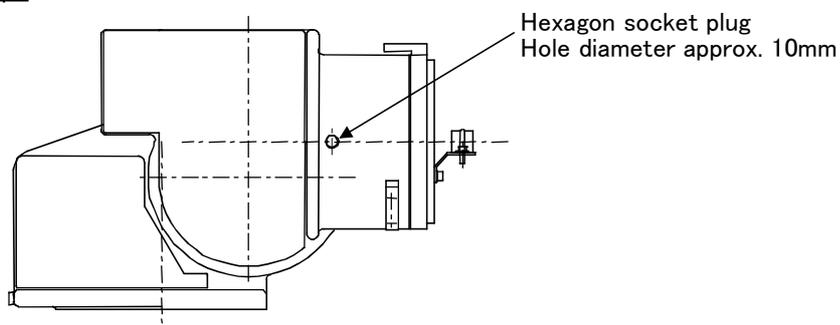
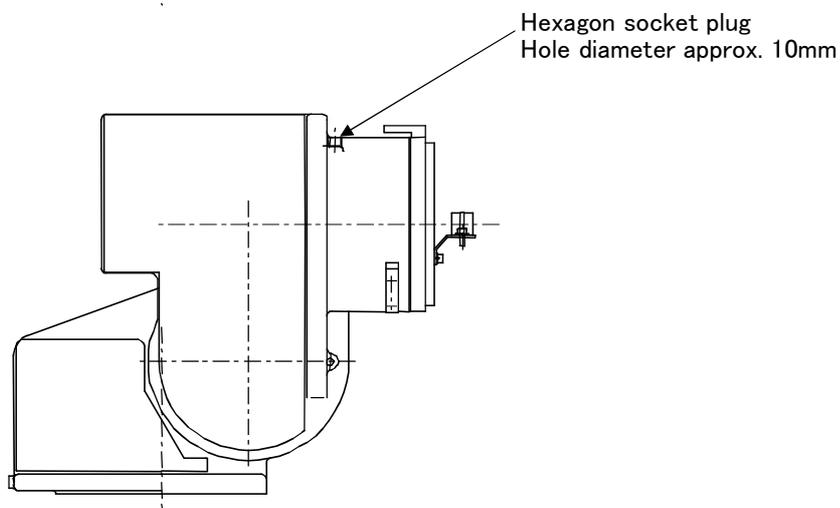
Standard wrist typeOffset wrist type

Fig.5-26 : J5 axis grease replenishment (RH-1500G series 6-axis type)

### 5.3.3 Replacing the backup battery

An absolute encoder is used for the position detector, so the position must be saved with the backup battery when the power is turned OFF. The controller also uses a backup battery to save the program, etc. These batteries are installed when the robot is shipped from the factory, but as these are consumable parts, they must be replaced periodically by the user.

The guideline for replacing the battery is one year, but this will differ according to the robot's usage state. When the battery life nears, the "Battery cumulative time over alarm (Alarm No. 7520)" will occur. Once the alarm occurs, replace all batteries in the robot arm and controller as soon as possible. Lithium batteries (type: A6BAT and ER6) are used in both the controller and robot arm. The battery replacement procedures are as follow.

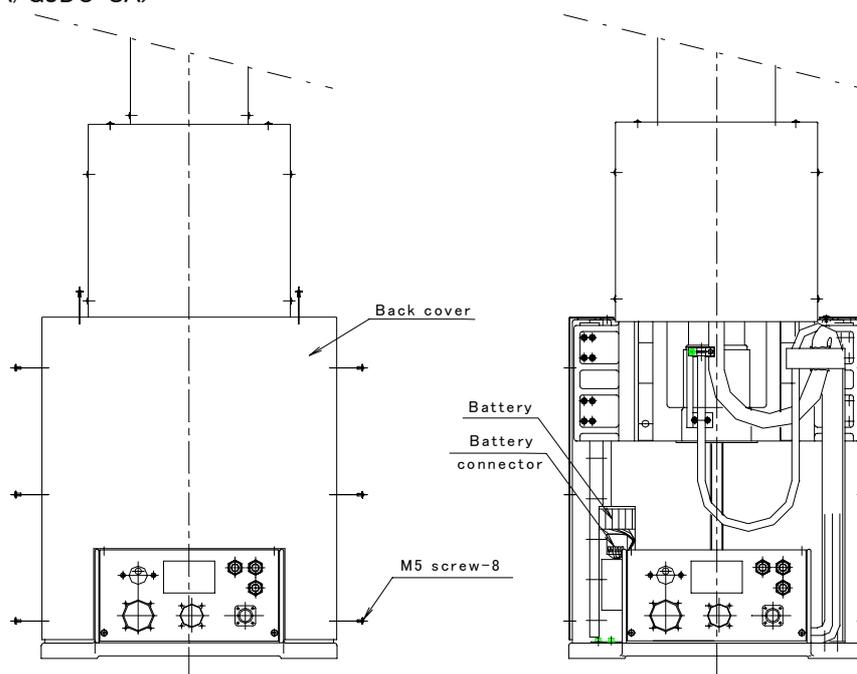
#### (1) Replacing the robot arm battery



### CAUTION

Don't disconnect connector, etc. While replacing the battery, the encoder position data is saved by the power supplied from the controller. Thus, if the cable connection is incomplete, the encoder position data will be lost when the controller power is turned OFF. Several batteries are used in the robot arm, but replace all old batteries with new batteries at the same time.

<RH-1000GHDC-SA/GJDC-SA>



<RH-1000GHLC-SA/GJLC-SA, RH1500G series>

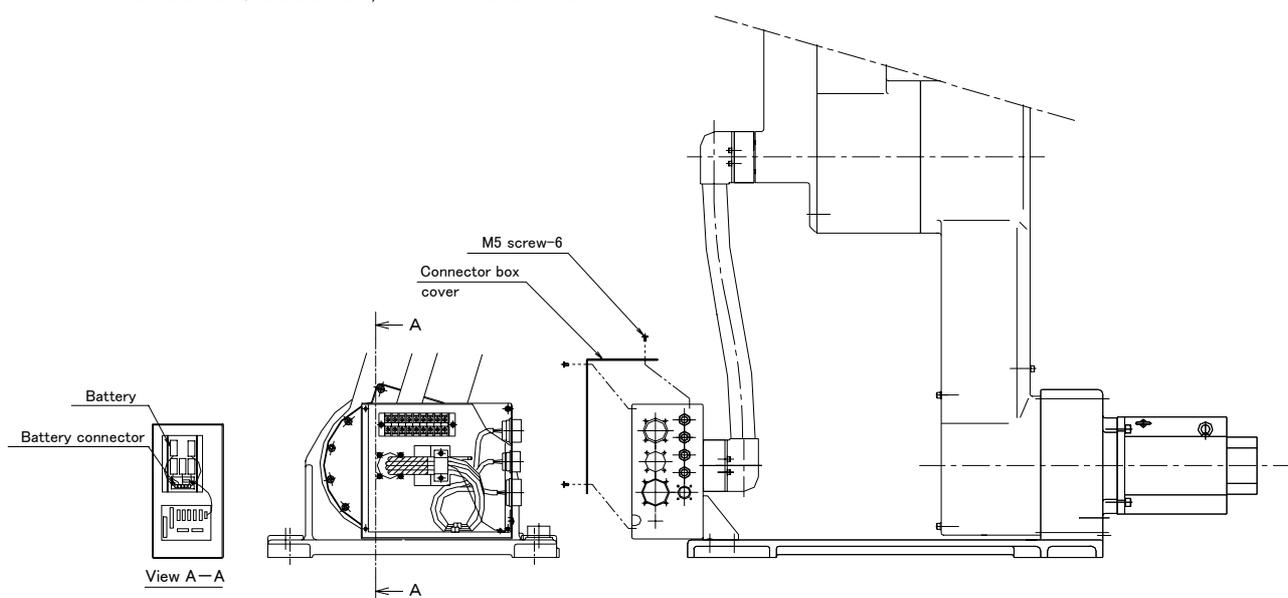


Fig.5-27 : Replacing the battery

- 1) Confirm that the robot arm and controller are connected with a cable.
- 2) Turn the controller control power ON. The position data is retained by the power supplied from the controller while replacing the battery. Thus, if the cable is not connected correctly, or if the controller power is OFF, the position data will be lost.
- 3) Press the emergency stop button to set the robot in the emergency stop state. This is a measure for safety, and must always be carried out.
- 4) Remove the cover from the robot.
- 5) Remove the old battery from the holder, and disconnect the lead connector.
- 6) Insert the new battery into the holder, and connect the lead connector. Replace all batteries with new ones at the same time.
- 7) Install the cover as the origin.
- 8) Initialize the battery consumption time. Always carry out this step after replacing the battery, and initialize the battery usage time. Refer to the separate "Instruction Manual/Detailed Explanation of Functions and Operations" for details on the operation methods.

### 5.4 Maintenance parts

The consumable parts that must be replaced periodically are shown in Table 5-4, and spare parts that may be required during repairs are shown in Table 5-5. Purchase these parts from the dealer when required. Some Mitsubishi-designated parts differ from the maker's standard parts. Thus, confirm the part name, robot arm and controller serial No. and purchase the parts from the dealer.

The consumable parts for each robot arm model are separately indicated in the table, so refer the section for the corresponding model.

Table 5-4 : Consumable part list

No.	Part name	Type	Q'ty	Usage place	Supplier
Model : RH-1000GHDC-SA					
1	Grease	AEF grease	100g	J3 axis: Linear guide, Ball screw J8 axis: Linear guide (for installation on travel frame)	Mitsubishi Electric
		Multipurpose No. 2 (N)	200g	J1,J2,J4 axis: Spur gears J8 axis: Rack & pinion (for installation on travel frame)	
		Moly White RE No. 00	400g	J3 axis Spur gears	
2	Lithium battery	A6BAT	4	J3 axis	
3			2	J8 axis(for installation on travel frame)	
Model : RH-1000GJDC-SA					
1	Grease	AEF grease	100g	J3 axis: Linear guide, Ball screw J8 axis: Linear guide (for installation on travel frame)	Mitsubishi Electric
		Multipurpose No. 2 (N)	200g	J1,J2,J4 axis: Spur gears J8 axis: Rack & pinion (for installation on travel frame)	
		Moly White RE No. 00	400g	J3 axis Spur gears	
2	Lithium battery	A6BAT	5	J3 axis	
3			2	J8 axis(for installation on travel frame)	
Model : RH-1000GHLC-SA					
1	Grease	Multipurpose No. 2 (N)	200g	J3 axis: Spiral bevel gears J1,J2,J4 axis: Spur gears J8 axis: Rack & pinion (for installation on travel frame)	Mitsubishi Electric
		AEF grease	100g	J8 axis: Linear guide (for installation on travel frame)	
2	Lithium battery	A6BAT	4	J3 axis	
3			2	J8 axis(for installation on travel frame)	
Model : RH-1000GJLC-SA					
1	Grease	Multipurpose No. 2 (N)	200g	J3 axis : Spiral bevel gears J1,J2,J4 axis: Spur gears J8 axis: Rack & pinion (for installation on travel frame)	Mitsubishi Electric
		AEF grease	100g	J8 axis: Linear guide (for installation on travel frame)	
2	Lithium battery	A6BAT	5	J3 axis	
3			2	J8 axis(for installation on travel frame)	

No.	Part name	Type	Q'ty	Usage place	Supplier
Model : RH-1500GJC*(5-axis type)					
1	Grease	Multipurpose No. 2 (N)	400g	J1,J4,J5 axis: Spur gears	Mitsubishi Electric
2	Lithium battery	A6BAT	5	J3 axis	
3			2	J8 axis(for installation on travel frame)	
Model : RH-1500GC* (6-axis type)					
1	Grease	Multipurpose No. 2 (N)	400g	J1,J4,J5,J6 axis: Spur gears	Mitsubishi Electric
2	Lithium battery	A6BAT	6	J3 axis	
3			2	J8 axis(for installation on travel frame)	

Table 5-5 : Spare parts list

No	Part name	Type	Q'ty	Usage place	Supplier
Model : RH-1000GHDC-SA					
1	Cable	BU159A935G51	1	J3 axis to No.1 arm	Mitsubishi Electric
2		BU159C936G51	1	J3 axis to J3 motor	
3		BU159A937G53	1	No.1 arm to hand	
4	Motor	BU159C930G51	1	J1axis	
5		BU159B931G51	1	J2 axis	
6		BU159C932G51	1	J3 axis	
7		BU159B931G52	1	J4 axis	
8		BU159C960G51	1	J8 axis(for installation on travel frame)	
9	Fan	YR107D908 G01	1	J3 axis	
10		YR107D908 G01	1	J8 axis(for installation on travel frame)	
11	Liquid seal	1212	100g	Apply on replacing motor	
12	Grease	G-501	200g	Apply on replacing cable	
Model : RH-1000GJDC-SA					
1	Cable	BU159A935G51	1	J3 axis to No.1 arm	Mitsubishi Electric
2		BU159C936G51	1	J3 axis to J3 motor	
3		BU159A937G52	1	No.1 arm to hand	
4	Motor	BU159C930G51	1	J1axis	
5		BU159B931G51	1	J2 axis	
6		BU159C932G51	1	J3 axis	
7		BU159B931G52	1	J4 axis	
8		BU159B931G53	1	J5 axis	
9		BU159C960G51	1	J8 axis(for installation on travel frame)	
10	Fan	YR107D908 G01	1	J3 axis	
11		YR107D908 G01	1	J8 axis(for installation on travel frame)	
12	Liquid seal	1212	100g	Apply on replacing motor	
13	Grease	G-501	200g	Apply on replacing cable	

No	Part name	Type	Q'ty	Usage place	Supplier
Model : RH-1000GHLC-SA					
1	Cable	YR102A454G03	1	J3 axis connector box to upper arm	Mitsubishi Electric
2		BU159B964G51	1	J3 axis upper arm to No.1 arm	
3		BU159A937G53	1	No.1 arm to hand	
4	Motor	BU159C930G51	1	J1axis	Mitsubishi Electric
5		BU159B931G51	1	J2 axis	
6		BU159C954G51	1	J3 axis	
7		BU159B931G52	1	J4 axis	
8		BU159C960G51	1	J8 axis(for installation on travel frame)	
9	Liquid seal	1212	100g	Apply on replacing motor	
10	Grease	G-501	200g	Apply on replacing cable	
Model : RH-1000GJLC-SA					
1	Cable	YR102A454G03	1	J3 axis connector box to upper arm	Mitsubishi Electric
2		BU159B964G51	1	J3 axis upper arm to No.1 arm	
3		BU159A937G52	1	No.1 arm to hand	
4	Motor	BU159C930G51	1	J1axis	Mitsubishi Electric
5		BU159B931G51	1	J2 axis	
6		BU159C954G51	1	J3 axis	
7		BU159B931G52	1	J4 axis	
8		BU159B931G53	1	J5 axis	
9		BU159C960G51	1	J8 axis(for installation on travel frame)	
10	Liquid seal	1212	100g	Apply on replacing motor	
11	Grease	G-501	200g	Apply on replacing cable	
Model : RH-1500GJ* (5-axis type)					
12	Cable	YR102A454 G03	1	J3 axis connector box to J3 axis lower arm	Mitsubishi Electric
13		YR102A454 G04	1	J3 axis upper arm through J1 axis	
14		YR102A456 G02	1	No.1 arm through J2 axis	
15		YR102A457 G02	1	No.2 arm through J4 axis	
16		YR103B730 G04	1	J5 axis through hand	
17	Silicone grease	G-501	80g	Apply on replacing cable	
18	Motor	BU159C953G51	1	J1axis	Mitsubishi Electric
19		BU159C930G52	1	J2 axis	
20		BU159C954G51	1	J3 axis	
21		BU159C930G53	1	J4 axis	
22		BU159B931G54	1	J5 axis	
23	Grease	Mori white RE No.0	400g × 7	Apply on replacing J3 motor	
24	Liquid seal	No.1212	100g	Apply on replacing J2,J3,J4 motor	

No	Part name	Type	Q'ty	Usage place	Supplier
Model : RH-1500G* (6-axis type)					
1	Cable	YR102A454 G03	1	J3 axis connector box to J3 axis lower arm	Mitsubishi Electric
2		YR102A454 G04	1	J3 axis upper arm through J1 axis	
3		YR102A456 G02	1	No.1 arm through J2 axis	
4		YR102A457 G02	1	No.2 arm through J4 axis	
5		YR103B729 G02	1	J5 axis through	
6		YR103B730 G03	1	J6 axis through hand	
7	Silicone grease	G-501	80g	Apply on replacing cable	
8	Motor	BU159C953G51	1	J1axis	Mitsubishi Electric
9		BU159C930G52	1	J2 axis	
10		BU159C954G51	1	J3 axis	
11		BU159C930G53	1	J4 axis	
12		BU159B931G54	1	J5 axis	
13		BU159B931G55	1	J6 axis	
14	Grease	Mori white RE No.0	400g × 7	Apply on replacing J3 motor	
15	Liquid seal	No.1212	100g	Apply on replacing J2,J3,J4 motor	

Note) Confirm the robot arm serial No., and contact the dealer for the type.

### 5.5 Resetting the origin

The origin is set so that the robot can be used with a high accuracy. After purchasing the robot, always carry out this step before starting work. The origin must be reset if the combination of robot and controller being used is changed or if the motor is changed causing an encoder area.

The types of origin setting methods are shown in Table 5-6.

Table 5-6 : Origin setting method

No	Method	Explanation	Remarks
1	Origin data input method	The origin data set as the default is input from the T/B.	The setting method is explained in Page 19, "2.3 Setting the origin".
2	ABS method	The setting method is applied if any backed-up data of the encoder is volatilized because of the battery shortage or similar.	Before applying this system, it is necessary necessary to completely set the origin on the same encoder once. The setting method is shown in "5.5.1ABS method".
3	User origin method	A randomly designated position is set as the origin posture.	Before using this method, the origin must be set with the origin data input method (No. 1 above) or ABS method (No. 2 above). The setting method is explained in Page 91, "5.5.2 User origin method".

#### 5.5.1 ABS method

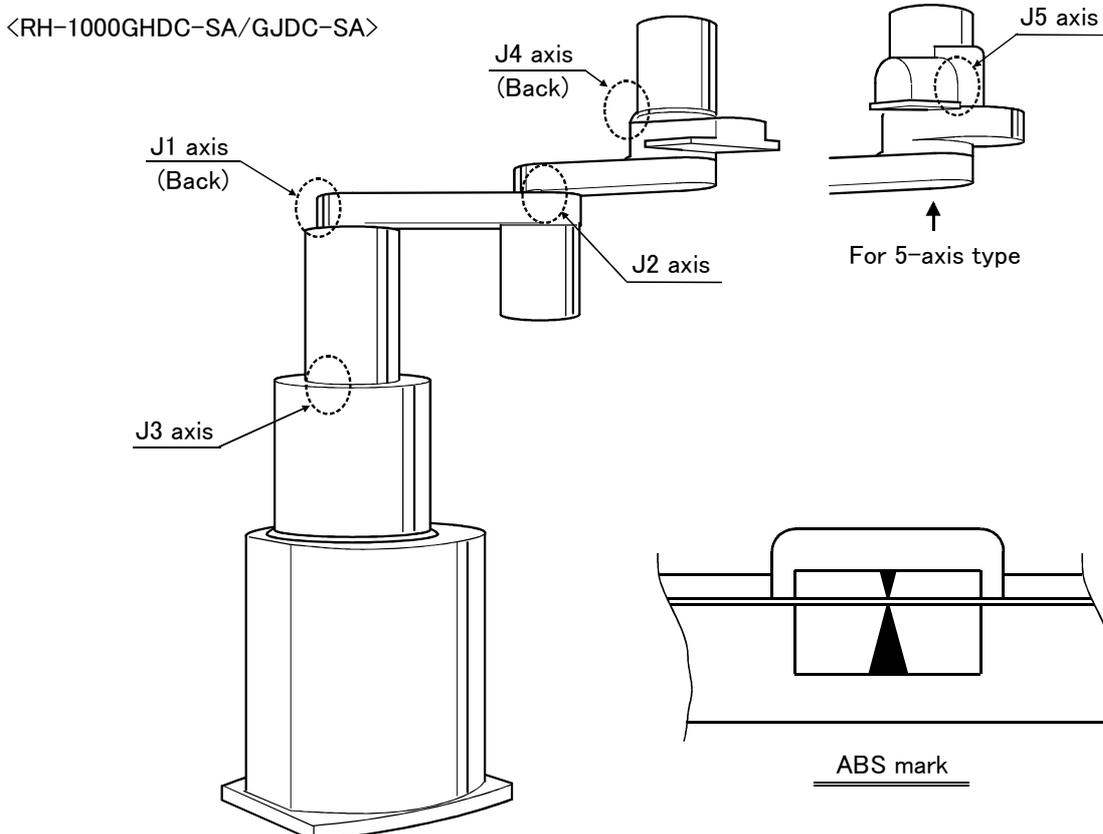
The procedures for setting the origin with the ABS method are explained below.

This operation is carried out with the teaching pendant. Set the [MODE] switch on the front of the controller to "TEACH", and set the [ENABLE/DISABLE] switch on the teaching pendant to "ENABLE" to enable the teaching pendant.

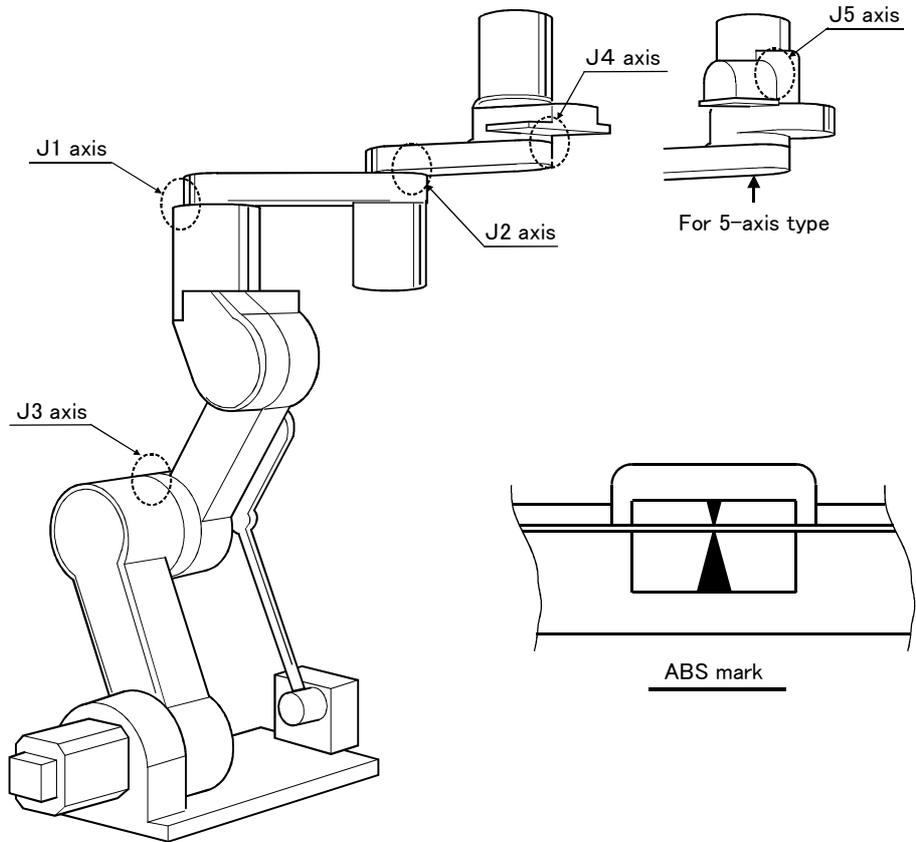
First, set to the ABS mark arrow of the axis for which the origin is to be set with jog operation. This can be set for all axes simultaneously or each axis independently.

When setting the ABS mark, always view the operations from the mark, and set at the end of the triangular mark.

The positions where the ABS mark is attached are shown in Fig. 5-28. Refer to Page 31, "(1) JOINT jog operation" for details on the jog operation.



<RH-1000GHLC-SA/GJLC-SA>



<RH-1500G series>

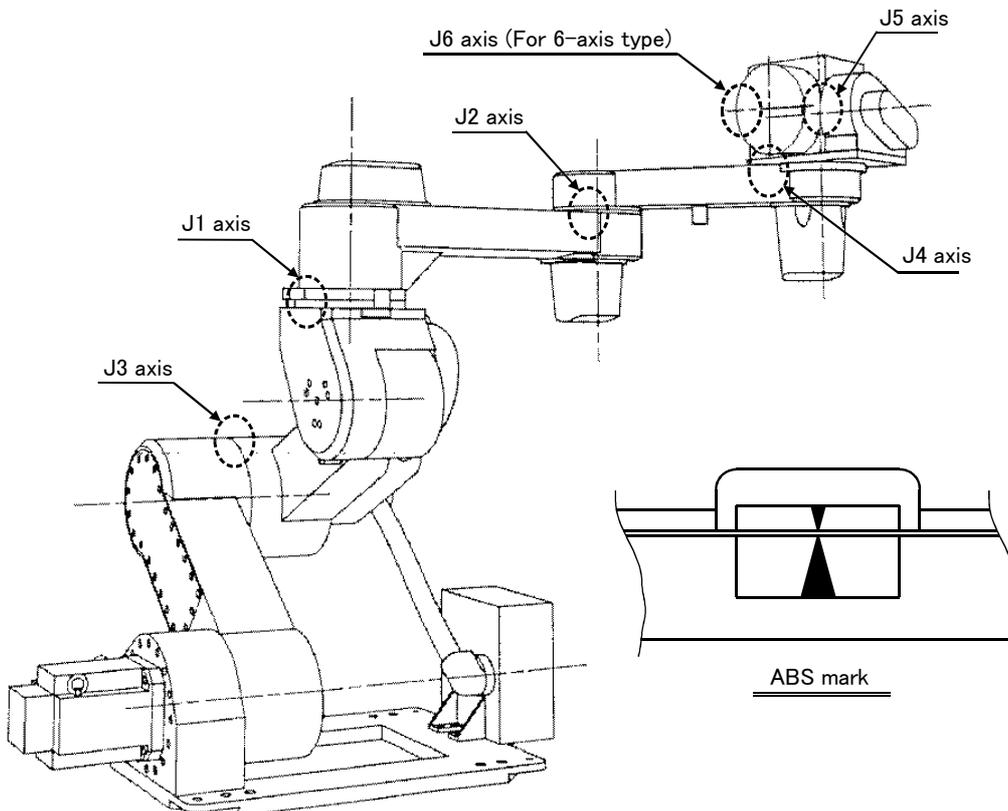
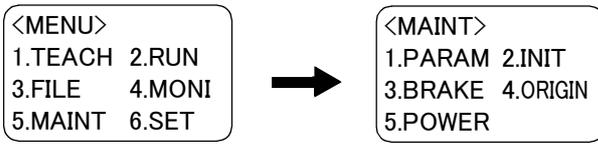


Fig.5-28 : ABS mark attachment positions

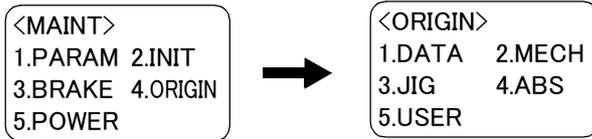
Carry out the following operations while lightly holding down the deadman switch on the teaching pendant.



1) Press the [5] key on the Menu screen to select the Maintenance screen.



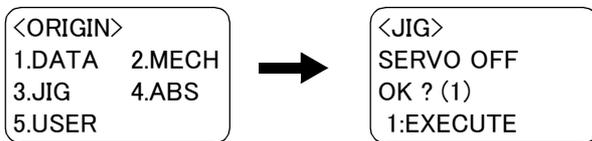
Select the Maintenance screen



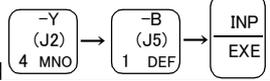
2) Press the [4] key to select the Origin Setting screen.



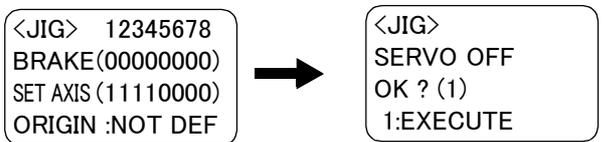
Select the Origin Setting screen



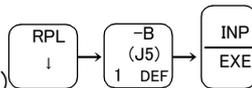
3) Press the [4] key to select the ABS method. After that, press the [1] key and [INP] key to turn the servo OFF.



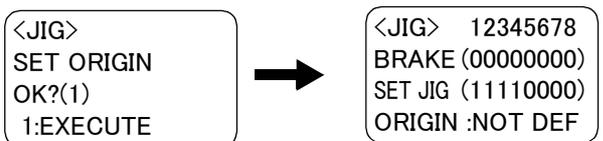
Select the jig method



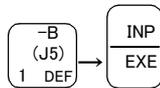
4) Press the [↓] key, and input "1" for the axis to set the origin in "Axis Designation". Press the [INP] key to display the Confirmation screen.



Execute the origin setting (confirmation)



5) Press the [1] key and then press the [INP] key. The origin will be set.



Execute the origin setting

This completes the setting of the origin with the ABS method.

## 5.5.2 User origin method



**CAUTION** Before using this method, the origin must be set with the origin data input method or ABS method.

The procedure for setting the origin with the user origin method is explained below.

This operation is carried out with the teaching pendant. Set the [MODE] switch on the front of the controller to "TEACH", and set the [ENABLE/DISABLE] switch on the teaching pendant to "ENABLE" to enable the teaching pendant.

The operation method is shown below.

When setting the origin for the first time using this method, carry out the operations in order from step 1). For the second and following time, move the robot arm to the user origin position with jog operation, and accurately position all axes. Then start the procedure from step 4).

1) Determine the user origin position

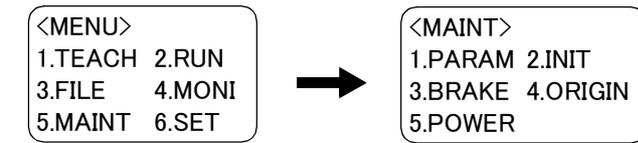
Move the robot to the position to be set as the origin with jog operation. Refer to [Page 25, "2.4 Confirming the operation"](#) for details on the jog operation.

[Caution] This position is left as a guideline to position all axes with jog operation when setting the origin again with this method.

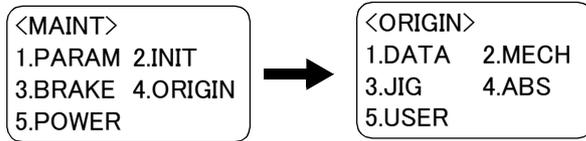
2) Enter the JOINT jog mode, and display the joint coordinates on the teaching pendant screen. Record the value of the axis for which the origin is to be set.

3) Input the value recorded in the "user designated origin parameter (USERORG)".

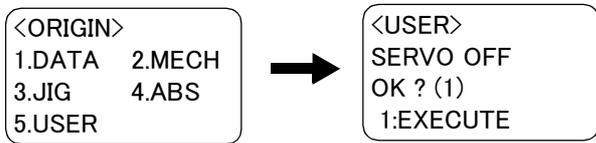
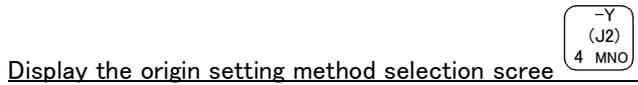
The parameter details and input methods are described in the separate "Instruction Manual/Detailed Explanation of Functions and Operations". Refer to that manual and input the user designated origin position.



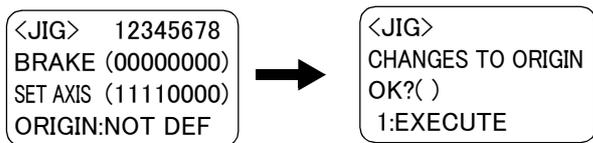
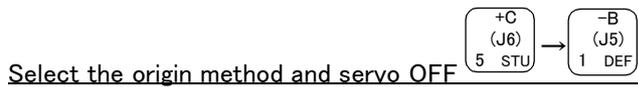
- 4) Next, set the origin.  
Press the [MENU] key to display the Menu screen.
- 5) Press the [5] key to display the Maintenance screen.



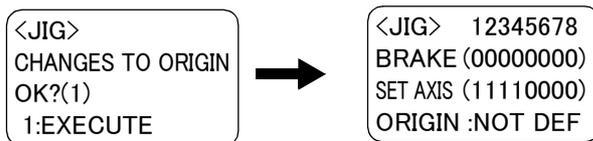
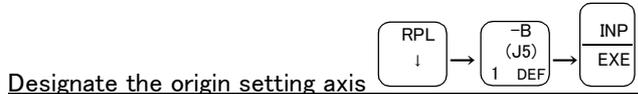
- 6) Press the [4] key to select the Origin Setting screen.



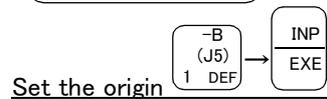
- 7) Press the [5] key to select the user origin method.  
Then, press [1] key and [INP] key to turn OFF the servo.



- 8) Press the [()] key, and input "1" for the axis for which the origin is to be set. Press the [INP] key to display the Confirmation screen.



- 9) Press the [1] key and then the [INP] key. The origin will be set.



This completes the setting of the origin with the user origin method.



HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100-8310 TELEX : J24532 CABLE MELCO TOKYO  
NAGOYA WORKS : 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN